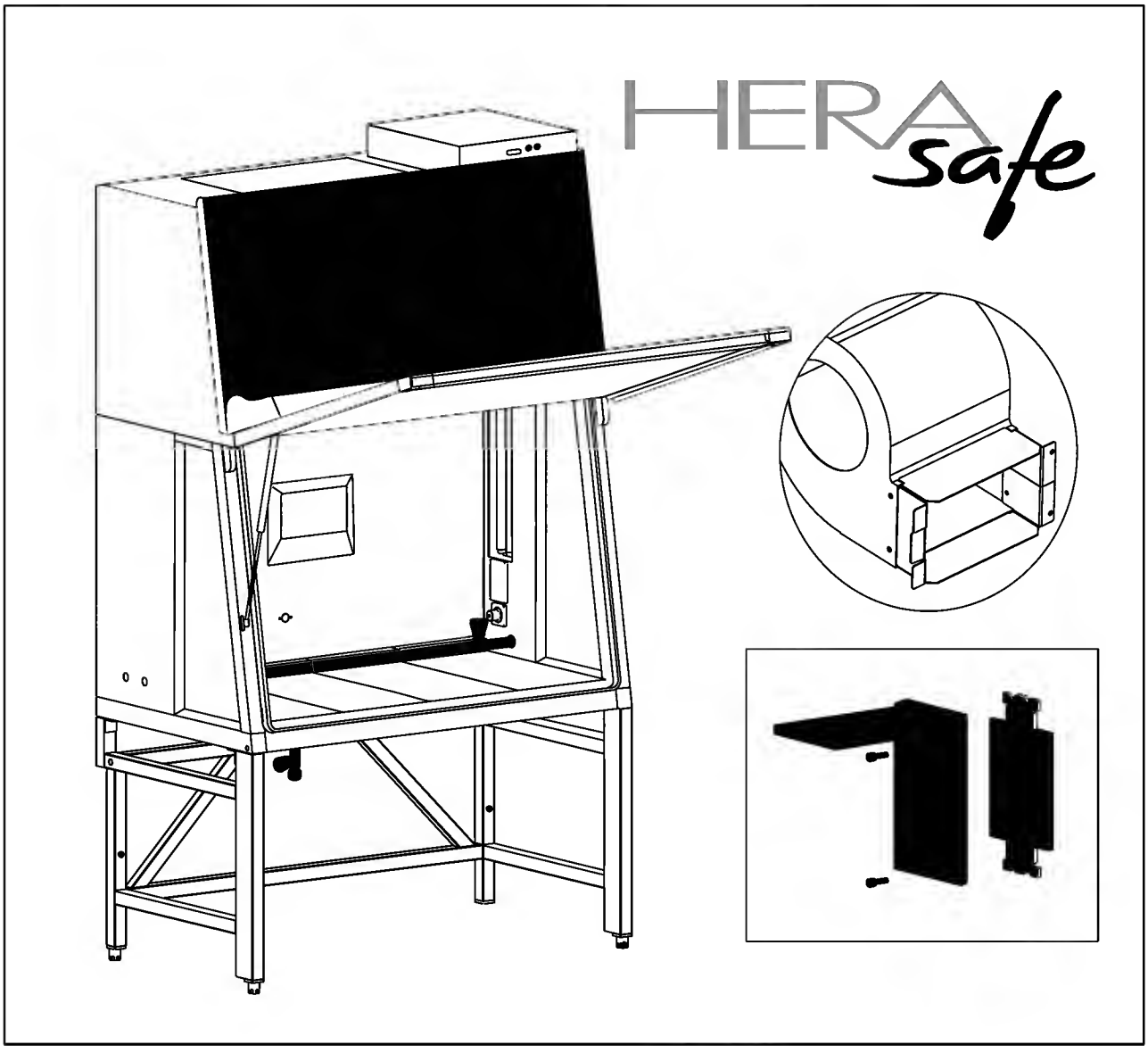
Kendro®

Service Instructions

Safety Cabinet HERAsafe



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Kendro Laboratory Products GmbH
Robert-Bosch-Straße 1
D - 63505 Langenselbold
Germany

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1. General notes

The following are the addresses of the international Kendro Sales Organisations.

Postanschrift Deutschland
Kendro Laboratory Products GmbH
Robert-Bosch-Straße 1
D - 63505 Langenselbold

Anfragen aus Deutschland
Telefon
Vertrieb 0800 1 536376
Service 0800 1 112110
Fax
Vertrieb/Service 0800 1 112114
E-Mail info@kendro.de

Enquiries from Europe, Middle East and Africa
Tel. + 49 (0) 6184 / 90-6940
Fax + 49 (0) 6184 / 90-7474
E-Mail info@kendro.com

Postal address USA
Kendro Laboratory Products Inc.
275 Aiken Road
Asheville, NC 28804
USA

Enquiries from North America
Phone +1 800-879 7767
Fax +1 828-658 0363
E-Mail info@kendro.com

Enquiries from Latin America
Phone +1 828-658 2711
Fax +1 828-645 9466
E-Mail info@kendro.com

Enquiries from Asia Pacific
Phone +852-2711 3910
Fax +852-2711 3858
E-Mail info@kendro.com

1.1 Safety instructions for service work

Please note that any repairs to the device must be carried out only by personnel with appropriate qualification. Prior to installing spare parts or performing repairs, read these service instructions and the operating instructions carefully.

- The replacement of defined spare parts must be performed only by the Technical Service of Kendro Laboratory Products or by authorized service personnel that has been trained by Kendro Laboratory Products.
- Electrical work must be carried out only by electrical expert personnel.
- Work to gas supply lines and to gas supply system components must be carried out only by trained gas and air conditioning expert personnel.
- Service work must be carried out in accordance with the applicable national regulations.
- The contents of the service instructions are subject to change without further notice.
- For translations into foreign languages, the German version of these operating instructions is binding.
- Should you encounter problems that are not detailed adequately in these operating instructions, please contact Kendro Laboratory Products immediately for your own safety.

1. General notes

1.2 Warranty

Kendro Laboratory Products warrant the operational safety and functions of the safety cabinet only under the condition that:

- the device is not modified. For safety reasons, unauthorized modifications or alterations to the device are not permitted.
- only original spare parts and accessories that have been defined and approved by Kendro Laboratory Products are used. The use of other parts presents unknown hazards and must therefore be refrained from.
- inspections and maintenance are performed at the specified intervals.
- a repeat test is conducted after any inspections and repairs.

1.3 Explanation of symbols

WARNING!

is used if non-observance may cause serious or even lethal injuries.

CAUTION!

is used if non-observance may cause medium to minor injuries or physical damage.

NOTE!

is used for hints and useful information.

RECYCLING!

Valuable raw materials can be reused.

Wear safety gloves!

Wear safety goggles!

1. General notes

Electric shock hazard!

Fire hazard!

Biohazard!

Hazardous gases!

1.4 Safety instructions for repairs

The general safety instructions point out potential hazards during repairs. To prevent constant repetitions, the following safety instructions are not mentioned explicitly in the individual sections; instead, the sections contain only references to the general safety instructions.
Prior to repairs, read the general safety instructions carefully.

WARNING - Contamination hazard!

As the safety cabinet can be used for processing toxic or infectious substances and materials, the device or device components may become contaminated.

Observe the hygiene regulations of the operator!

Toxic or infectious substances or residues thereof must be removed completely from the sample chamber!

1. **Prior to repairs, enquire the contamination hazard and make sure that the device has been cleaned and disinfected!**
2. **A certificate of nonobjection from the operator is required.**

1. General notes

WARNING - Electric shock hazard!

Contact with current-carrying components may cause a lethal electric shock.

Motor-driven moving device components may cause injuries when switched on accidentally.

Prior to repairs, disconnect the device from the power supply system!

1. **Isolate the device electrically.**
2. **Protect the device from accidental reconnection.**
3. **Make sure the device is deenergized.**
4. **Ground and short the device.**
5. **Cover or barrier adjacent components that are under voltage.**

CAUTION - Hazardous gases!

If gases are supplied into the safety cabinet, the external gas supply must be shut off prior to any repairs!

1. **Make sure the workrooms are adequately ventilated.**
2. **If equipped, activate the exhaust system.**
3. **Observe safety data sheets.**
4. **Report damaged or faulty supply lines to the operator of the device.**

NOTE - Recycling

All device components except the filters can be recycled.

If the device was used to process toxic or infectious substances, the required decontamination measures must be taken prior to disposal or shipping.

1. General notes

NOTE - Start-up

If safety devices were removed or disabled during repairs, the unit must not be started up before the safety devices have been reinstalled and checked for proper operation!

Before the unit is started up and operated, a test run must be performed.

1.5 Standards and safety regulations

The device complies with the safety requirements of the following standards and directives:

USA / Canada
- IEC 1010-1 / UL 3101-1
- NSF, Standard 49/1992

Europe / Middle East / Africa
- IEC 1010-1 / EN 61010-1
- EN 12469 / 2000
- Low Voltage Directive 73/23 EWG
- EMC Directive 89/336 EWG

Australia / Asia / Pacific
- IEC 1010-1
- AS 2252.2

2. Tools and auxiliaries

2.1 Auxiliaries

Screw connections:
All screw connections have metric threads.

Screw lockings:
All retaining screws with a diameter of 3 mm or more must be installed with a separable adhesive (medium tight) before they are tightened.
Recommended product: Loctite 586.

Torques:
All retaining screws must only be tightened finger-tight (without leverage).

Sealant:
Recommended product: Sista F 109 (Item 190, sealant)

Cleaner:
Commercial dishwashing agents based on soap suds.
Recommended product: Liquinox.

Disinfectant:
For the standard wipe/spray disinfection, a broad-range disinfectant can be used.
Recommended product: Barrycidal 36 or Microcide SQ.

2. Tools and auxiliaries

2.3 List of required tools

Multimeter	U / I / Ohm
Allen key set	1.5–6 mm
Open-end wrench set	6–32 mm
Phillips screwdriver set	magnetic
Slot-head screwdriver set	2–6 mm
Socket wrench set	6–32 mm
Diagonal cutter	small
Wire stripper	
Flat connector pliers	
Needle nose pliers	small
Tweezers	
Starter punch	small
Level	small
Heat gun	
Soldering iron	
Solder	
Cable ties	small, black
Screw locking adhesive	medium tight, solvable, from M3
Shrink tube	d = 6 mm
Shrink tube with sealant	d = 6 mm
Flat connectors	6.3 mm
Wire end ferrules	1 mm^2

3. Accessories

NOTE - Item numbers

The item numbers refer to the spare parts list at the end of these service instructions.

3.1 Exhaust system accessories

Item 1380 (filter)

Fig. 1: The safety cabinet can be equipped with the following exhaust system accessories.

Accessories for exhaust system:
- Exhaust manifold [1] for the direct connection to an on-site exhaust system.
- Draft interruptor [2] for the direct connection to an on-site exhaust system with blower.

Accessories for downflow operation:
- Supplementary filter KAEF [3] for exhaust air
- Supplementary filter KAFC [4] with carbon insert for exhaust air

3.2 Installing exhaust system accessories

Item 190 (sealant)

Fig. 1: The exhaust system components [1-4] are installed to the exhaust aperture [6] at the device ceiling. The four thread inserts [7] for the retaining screws [6] are preinstalled in the device ceiling.
To install the supplementary filter KAEF, additional holes must be drilled. For hole dimensioning and positioning, refer to the drilling template supplied with the separate installation instructions for supplementary filter KAEF.

Installation:
1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Thoroughly clean the contact surfaces around the exhaust aperture and of the accessory to be installed to ensure that they are absolutely grease- and dust-free.
3. Apply sealant onto the contact surfaces.
4. Secure the accessory by tightening the supplied six retaining screws (M 5) finger-tight.
5. Remove any sealant coming out of the joint.

Connection to technical ventilation:
6. The exhaust manifold and the draft interruptor are installed between the safety cabinet and the exhaust pipe of the on-site exhaust system.

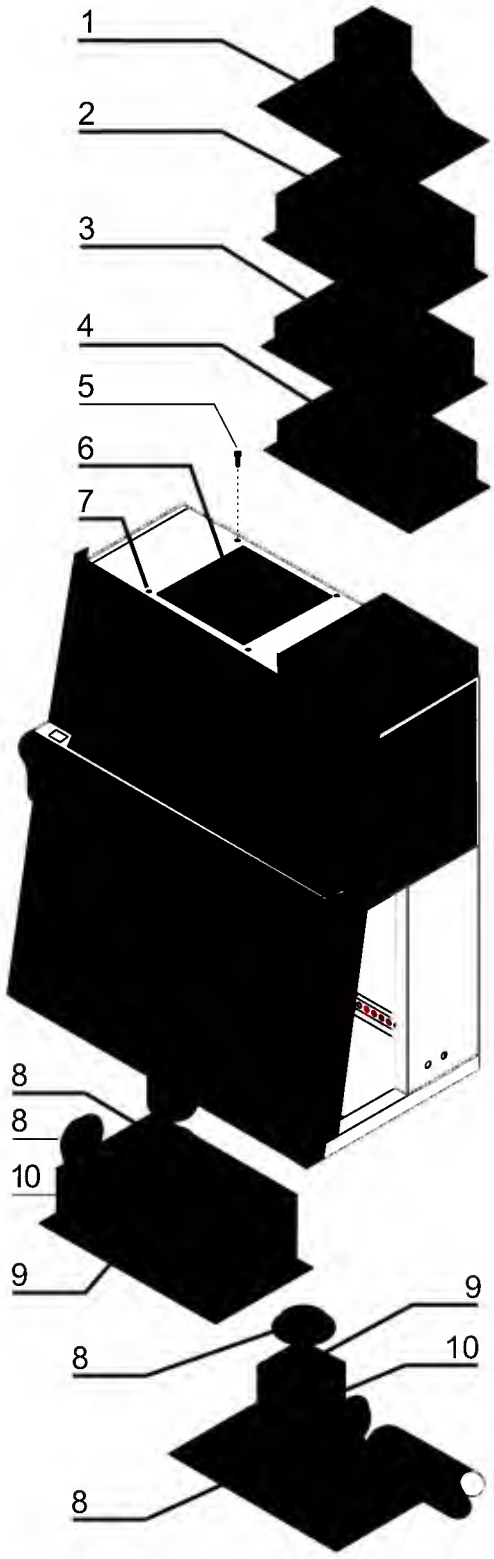


Fig. 1,
Exhaust system accessories

3. Accessories

7. The supplied adapter [8] (Ø 200 mm) is screwed onto the aperture of the exhaust manifold or draft interruptor.
8. The pipe fitting can be installed to the exhaust manifold either at the top [9] or at the side aperture [10].

3.3 Exhaust system accessories for disinfection

Item 1000 (ball valve)
Item 1390 (carbon filter)

Fig. 2: The disinfection hood with carbon filter [6] is installed to the exhaust aperture [7] at the device ceiling. Discharged air or gases are routed into the carbon filter [3]. Alternatively, a hose connection to an on-site exhaust system can be connected to the shut-off valve [5].
The contact surfaces are sealed by a rubber seal at the disinfection hood.
The four thread inserts [1] for the retaining screws [2] are preinstalled at the device ceiling.

Installation:
1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Thoroughly clean the contact surfaces around the exhaust aperture to ensure that they are absolutely grease- and dust-free.
3. Secure the disinfection hood by tightening the supplied four retaining screws (M 5) finger-tight.

Use of the disinfection hood in combination with an exhaust system:
Fig. 2: A flexible hose [4] connects the carbon filter [3] to the shut-off valve [5]. A correspondingly extended exhaust hose can route discharged air or gases into an appropriate exhaust system; this requires corresponding hose material (Ø ½") at the site.

Connecting the hose:
1. Disconnect the hose between the carbon filter and the shut-off valve [5].
2. Connect one end of the extended hose [8] to the connecting sleeve of the shut-off valve [5] and the other end to the exhaust system.

☞ **NOTE - Disinfection hood**

The use of the disinfection hood in the disinfection procedure is described at the end of these service instructions.

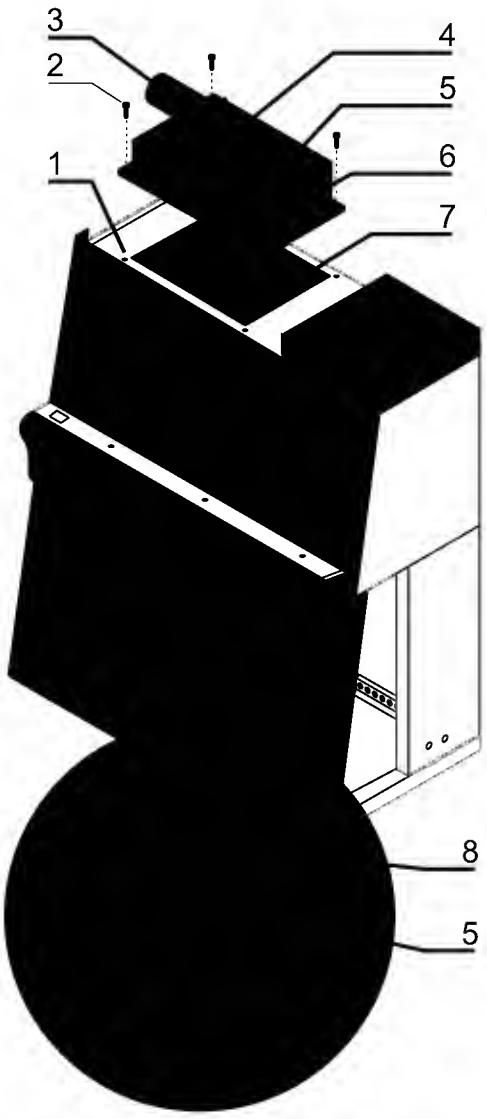


Fig. 2,
Exhaust system accessories for disinfection

3. Accessories

3.4 Fixed rack

Item 1370 (stand)
Item 1360 (roller)

1. **Fig. 3:** Secure the two sidemembers [1] to the crossmember [3] using the screws [4].
2. Place the safety cabinet onto the rack. Check to see if the locating pins [10] are positioned correctly in the receptacles at the lower device frame.
3. Secure the device to the rack using the retaining angles and one retaining screw [11] (M 4 x 16) on all four vertical rack posts.
4. Align the safety cabinet working area. Place a bubble level onto the workplate and rotate the stands [2] of the rack using an open-end wrench (size 30 mm) until the workplate is exactly horizontal in all directions. For the height adjustment of the rack stands, proceed from left to right and from rear to front.
5. Cap the holes for the rack screw connections with plastic plugs.

3.5 Height-adjustable rack

The height of the height-adjustable rack can be set within a range of 680-880 mm.

1. **Fig. 3:** Extract the stands from the sidemember guides to the desired height. To lock the height adjustment:
   - Install the screws [9] to the front stands.
   - At the rear stands, install the screw [8] through the sidemember stand and secure it using the cap nut.
2. Install the two sidemembers [5] to the crossmember [5] using the screws [7].
3. Secure the device housing to the rack using the screws, then align it horizontally (see Section 3.4).
4. Cap the holes with the plugs.

3.6 Height-adjustable rack with electric drive

Pos. 1400 (lift unit left)
Pos. 1410 (lift unit right)
Item 1420 (control)
Pos. 1430 (remote control Multilift)
Pos. 1440 (operation instructions Multilift)

Fig. 3: The height of the height-adjustable rack can be set within a range of 680-880 mm. Bothe sidemembers [16] have their own electromagnetic drive [12] that is controlled by the synchronizer module [14].

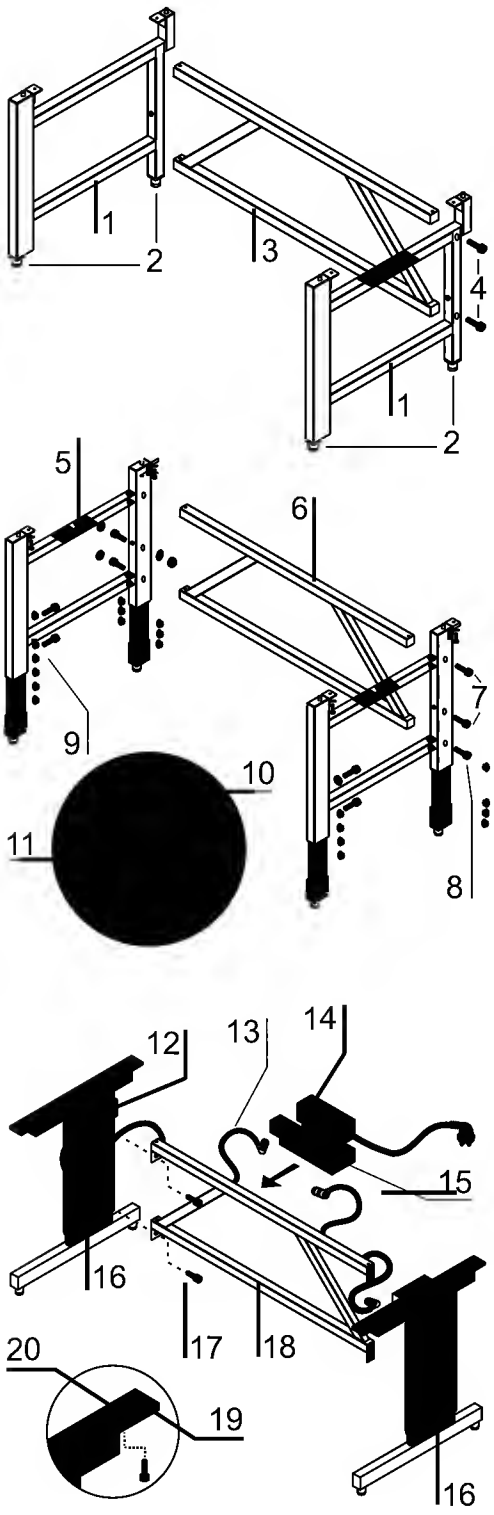


Fig. 3,
Rack assembly

3. Accessories

1. **Fig. 3:** Secure the two sidemembers [16] to the crossmember [18] using the screws [17].
2. Install the panel [15] to the crossmember and place the synchronizer module [14] onto the panel.
3. Connect each of the two connecting cables [13] to the synchronizer module [14] and to the electric motors [12].
4. Place the safety cabinet onto the rack so that it is secured by the locating pins [19]. Secure the housing to the rack by installing the screws through the four holes [20] on the sidemembers.
5. Align the housing horizontally (see Section 3.4).

3.7 Drain valve (optional)

Item 1000 (ball valve, adjustable)
Item 1010 (drain with ball valve)

Fig. 4: The drain valve [2] can be installed to the floorpan in the left front area of the sample chamber. The access opening is sealed by a panel [3] that is secured merely by the sealant.

1. Separate the sealant using a thin blade, then remove the panel [3].
2. Place the gasket [5] onto the sleeve [6] of the drain valve. Hold the sleeve [6] against the floorpan from below and secure it by installing the three screws [4] through the openings in the floorpan.
3. Insert the seal [7] into the groove in the drain valve, then screw the drain valve [2] into the sleeve [6] and tighten it.
4. Check the drain valve and the floorpan for tightness.

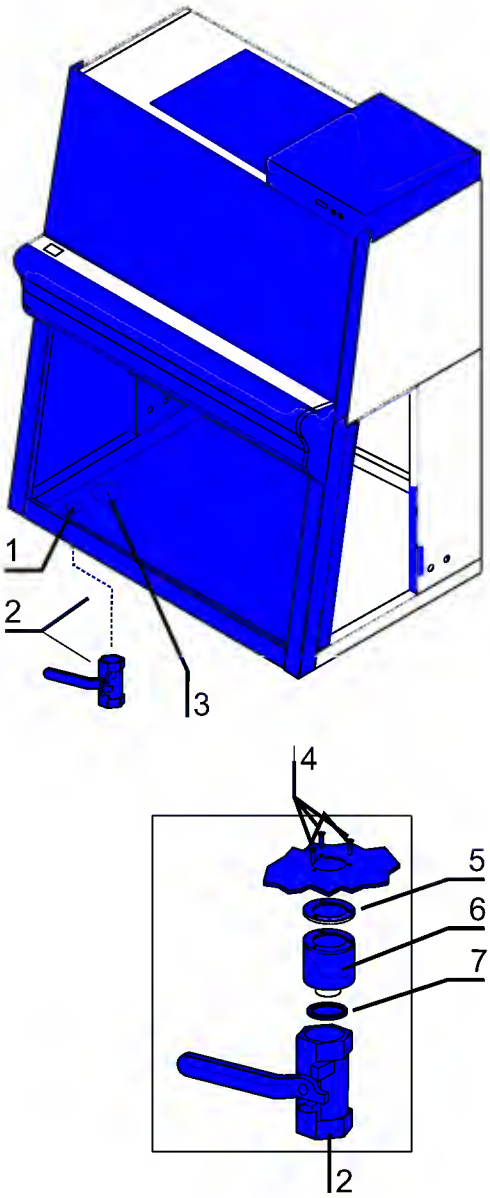


Fig. 4,
Drain valve installation

4. Media connections

4.1 Installation points for media valves (optional) at the sample chamber rear panel

Fig. 5: The supply lines for media commections are preinstalled to the device frame and are routed to the sample chamber rear panel through the ceiling openings [1].
The connections can be positioned to the left [2] or right [3] of the rear panel.
The on-site connections are designed for R 3/8" threads.
The connections are suitable for the installation of laboratory fittings R 3/8". Upon delivery of the device, the connections are sealed with plugs and screwed-on bezels.

Distances at the device ceiling

A1	25 mm
A2	70 mm
D1	50 mm
D2	105 mm
D3	160 mm

Distances at the device rear panel

A3	150 mm
R1	370 mm
R2	470 mm
R3	570 mm

The media connection inlets and outlets are assigned according to a fixed pattern as shown in item [4].

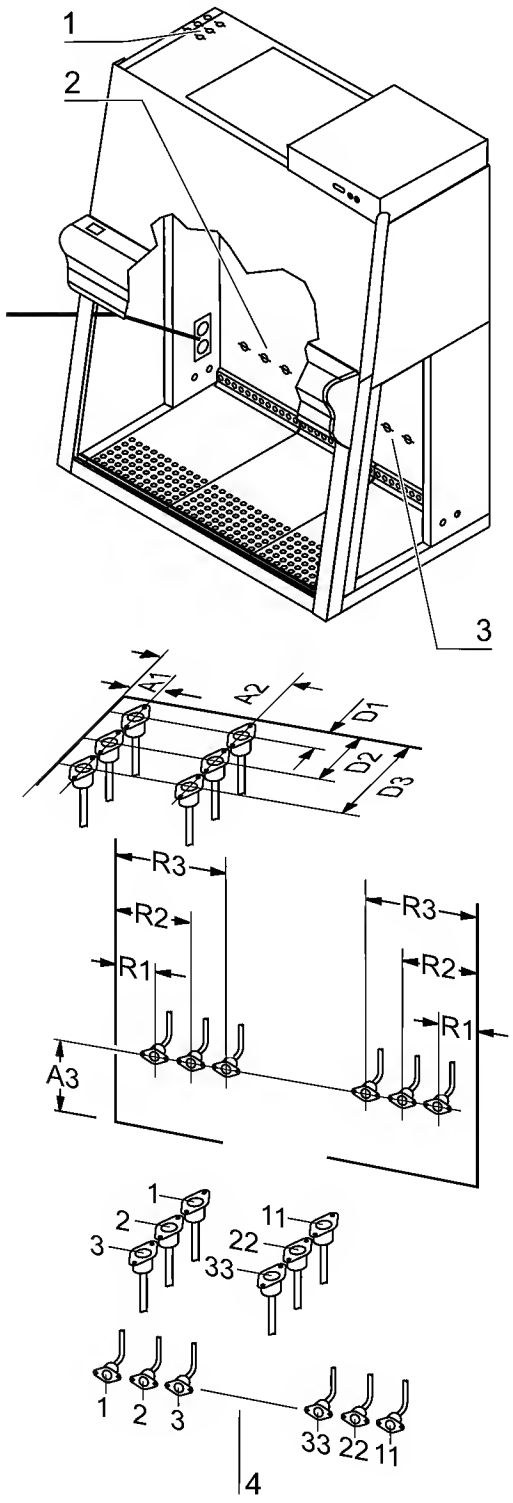


Fig. 5,
Installation points at the rear panel

4. Media connections

4.2 Installation points at the sample chamber sidewalls

Item 170 (plug for lead-ins)
Item 180 (flat gasket for screw plug USA)

Fig. 6: The standard equipment of the device comprises two lead-ins [1] and [2] per sidemember. They can also be used for installing laboratory fittings R 3/8".
Upon delivery of the device, the lead-ins are capped tightly.

- Application in USA/Canada:
  Interior plug and exterior safety glass screw connection
- Application in EU:
  Exterior plug

Distances at the side of the device

A3	135 mm
S1	160 mm
S2	90 mm

NOTE - Media routing

The lead-ins must only be used for the installation of media valves if said installation is in accordance with the applicable national regulations.

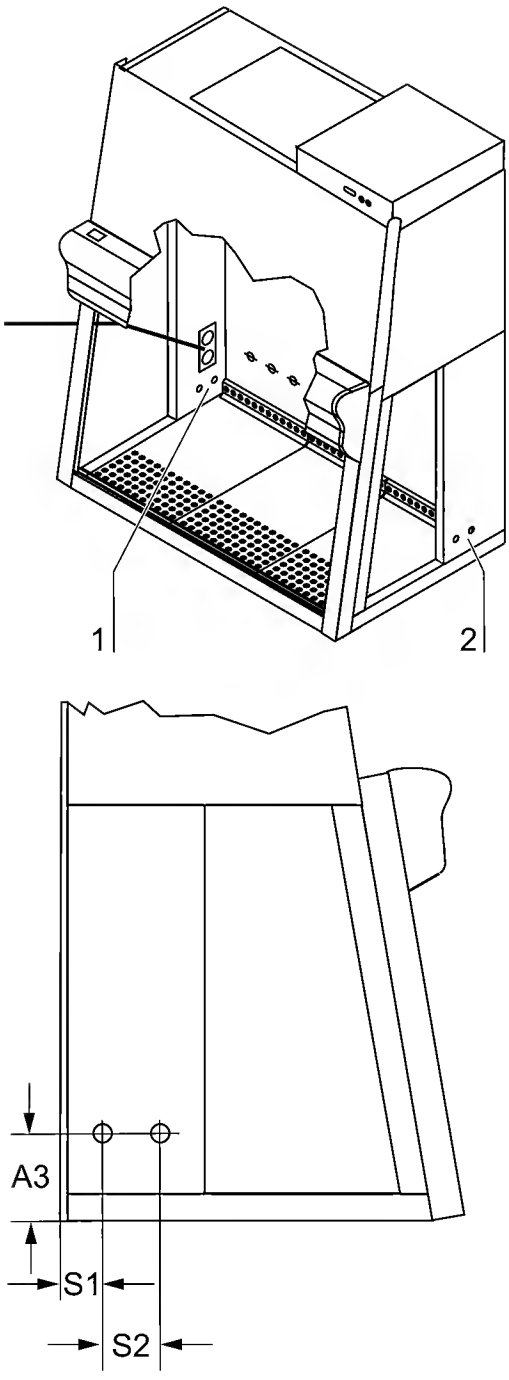


Fig. 6,
Installation points at the sidewall

4. Media connections

4.3 Installing media valves

Item 320 (bezel)
Item 325 (plug)

Installing media valves to the rear panel:
The media valves at the device rear panel are screwed into the preinstalled connections.

1. Move the front window to the maximal opening position.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. **Fig. 7:** Unscrew the plug from the supply line at the rear panel of the sample chamber [9].
4. Slide the gasket [6] onto the threaded pipe [5] of the media valve [7].
5. Wrap the threaded pipe [5] of the media valve with sealing tape.
6. Screw the media valve into the threaded sleeve [4].
7. Check the screw connection for tightness.
8. Unscrew the plug from the supply line at the device ceiling [8].
9. Screw a threaded pipe with hexagon [2] into the receptacle [3] at the device ceiling and connect it to the media supply line using a union nut [1].

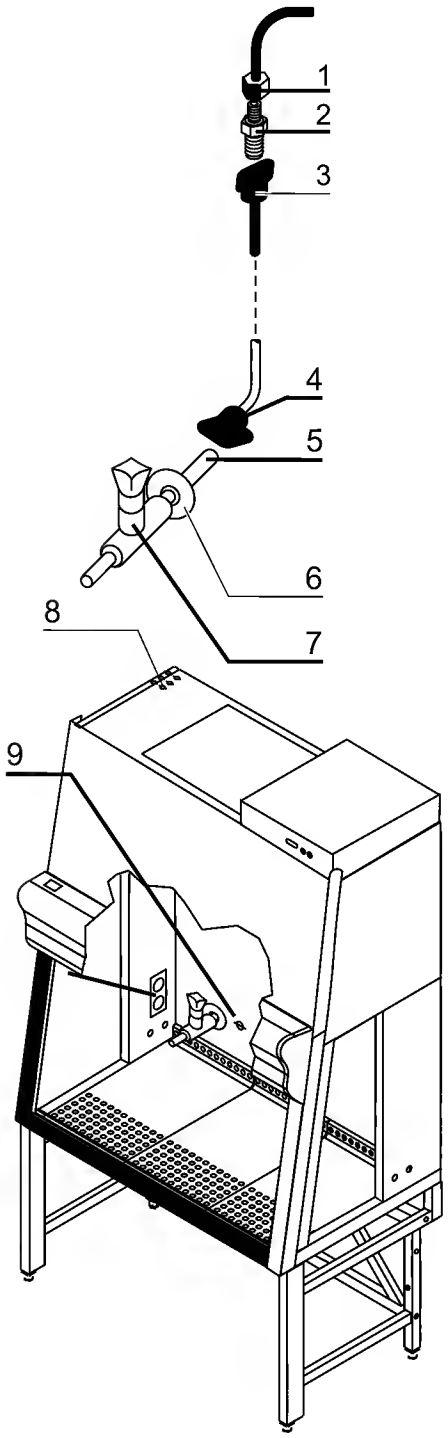


Fig. 7,
Media valve installation at the rear panel

4. Media connections

Installing media valves to the sidewall:
Fig. 8: The media valves are installed to the preinstalled lead-ins [1].

1. Move the front window to the maximal opening position.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the plug from the sidewall lead-in or remove the plug and disconnect the PG screw connection.
4. Slide the gasket [5] and the bezel [4] onto the threaded pipe of the media valve [8].
5. From the inside of the sample chamber, push the media valve through the lead-in.
6. From the outside, slide the other gasket [6] onto the threaded pipe of the media valve.
7. Secure the media valve to the sidewall lead-in using the nut [8].
8. Connect the meadia supply line using a union nut [9].

NOTE - Combustible gas

If combustible gas is to be supplied into the sample chamber, the media valve solenoid must be integral to the device control. The gas supply is controlled in a way that the gas supply is activated when the device is operational. Appendix C of these service insructions contains wiring diagrams for integrating the solenoid into the device control.

Installing the solenoid:
The solenoid is installed externally, either to the sidewall supply line or to the supply lines at the device ceiling.
1. Install the solenoid [10] into the supply line.
2. Connnect the connecting cables to the device control (see wiring diagrams in Appendix C).

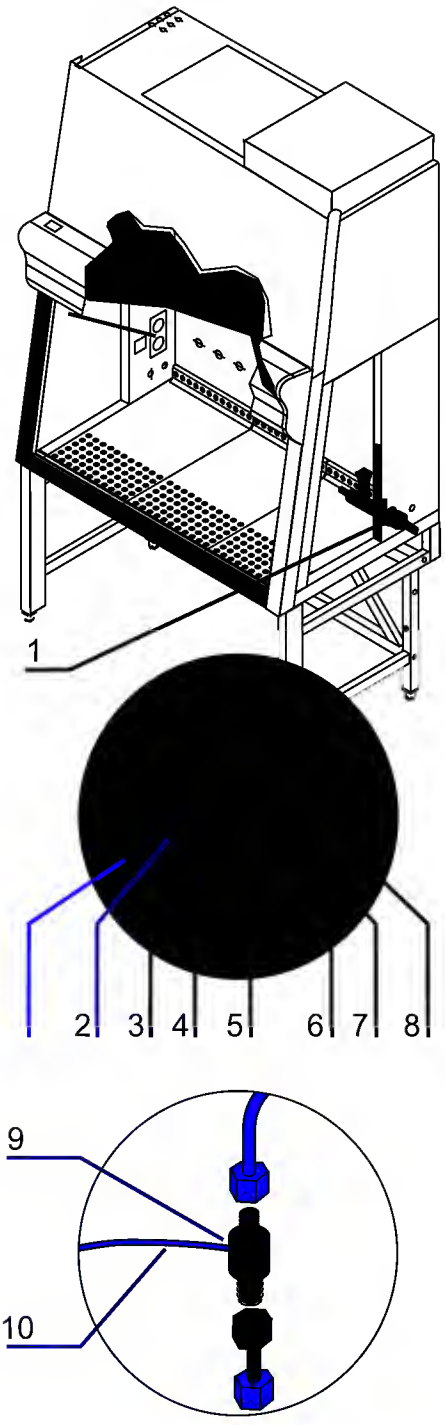


Fig. 8,
Installing media valves to the sidewall

5. Lamps

5.1 Replacing the luminescent tubes

Item 820 (luminescent tube)
Item 870 (light box shroud)

Fig. 9: The sample chamber is illuminated by two luminescent tubes [3]. The sprung tube sockets are installed at the front door mounting frame [4].

1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Remove the three retaining screws [1] from the light box shroud [2] and remove the shroud.
3. The luminescent tubes are mounted in rotating sockets. Rotate the tube carefully into the removal position, then remove it from the socket.
4. Insert the new tube and rotate it into the working position.
5. Position the light box shroud at the mounting frame and secure it using the three retaining screws.

5.2 Replacing the luminescent tube sockets

Items 440, 450 (luminescent tube sockets)

Fig. 9: The sockets [7] of the luminescent tubes are secured to the recesses [6] in the mounting frame by the retainers [5].

1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Remove the three retaining screws [1] from the shroud [2] and remove the shroud.
3. Disconnect the wires of the socket (see Annex C, Wiring Diagrams).
4. Pry the retainer [8] off the recess [6] and lift the socket through the recess.
5. To install, insert the new socket through the mounting frame recess and push the socket retainer [8] into the recess so that the socket is secured to the panel.
6. Connect the connecting cable [5] to the socket.
7. Position the light box shroud at the front door mounting frame and secure it using the three retaining screws.

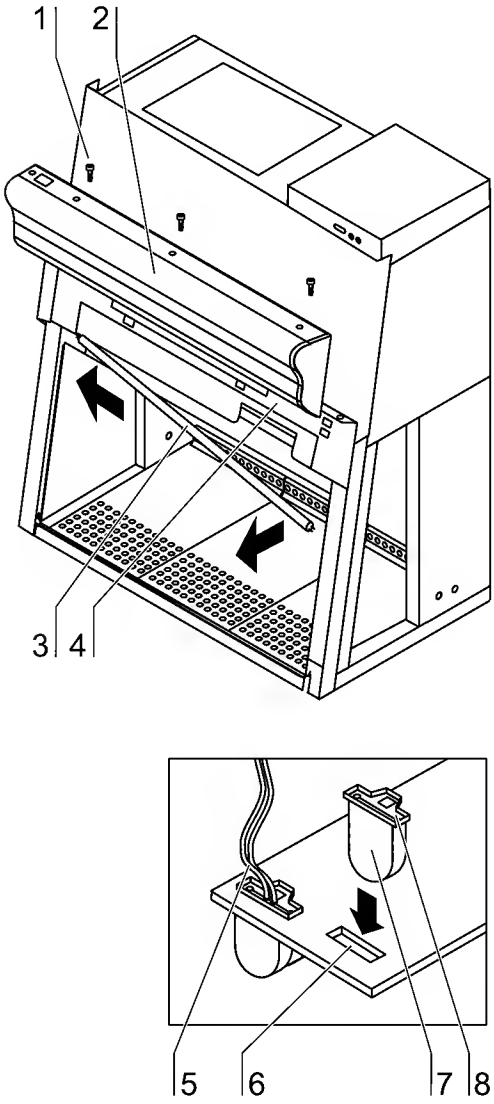


Fig. 9,
Luminescent tube and socket replacement

5. Lamps

5.3 Replacing the illumination power supply unit

Item 800 (power supply unit)

Fig. 10: The power supply unit [3] for the two luminescent tubes is attached to the front door mounting frame.

1. Lower the front window all the way.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the light box shroud (see Section 5.1).
4. Disconnect the device from the power supply.
   - ▶ Application in USA/Canada:
     Disconnect the connecting cable [7] from the terminal strip [6].
   - ▶ Application in EU:
     Disconnect the connecting cable [5] from the terminal strip [2].
5. Disconnect the wiring of the power supply unit [3] from the terminal strip [4].
6. Two screws [1] secure each end of the power supply unit to tabs at the mounting frame. Remove the screws, then remove the power supply unit.
7. Secure the new power supply unit to the mounting frame.
8. Connect the wiring.
9. Position the light box shroud and secure it using the screws.

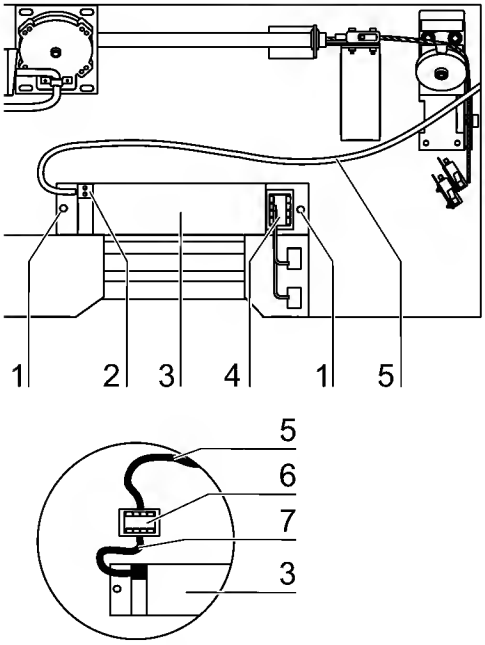


Fig. 10,
Illumination power supply unit replacement

5.4 Replacing UV lamps

Item 100 (UV lamp)
Item 950 (bezels)
Item 110 (rotating socket UVC)

Fig. 11: The optional, device-integral UV lamps [1] are installed in two units [2] each behind the bezels [3] at the sample chamber sidewalls.
To ensure consistant UV radiation, always replace the entire lamp unit.

1. Unlock the front window and turn it up.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the bezels [3] from the sample chamber sidewalls.
4. The UV lamps are installed in rotating sockets [4]. To remove, rotate the lamp counterclockwise to disengage the latch and remove the lamp from the sockets.
5. To install, slide the lamp pins into the groove of the rotating socket and rotate the lamp clockwise to engage the latch.

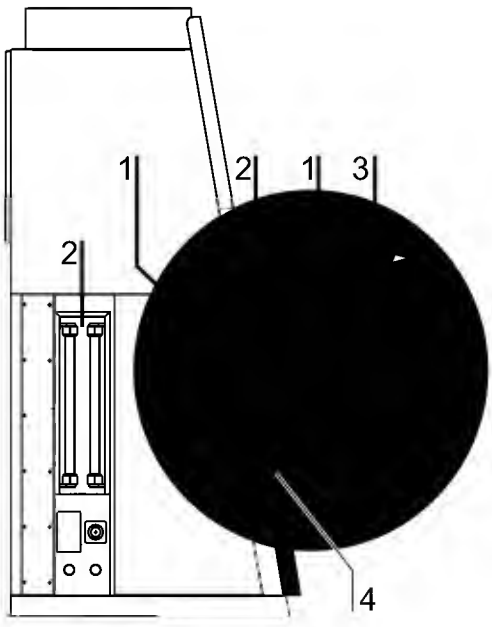


Fig. 11,
UV lamp replacement

5. Lamps

5.5 Replacing the UV lamp power supply unit

Item 40 (power supply units)
Item 50 (terminal)
Items 60, 70 (interior chamber shrouds)
Items 1110, 1120 (workplates)
Item 190 (sealant)

Fig. 12: The two power supply units [5] for the device-integral UV lamps are installed to the insert bezels [4].

1. Unlock the front door and turn it up.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the UV lamp.
4. Remove the two retaining screws [2] of the insert bezel [4] and slide the insert bezel out only so far that the power supply unit [5] is accessible.
5. Disconnect the wiring from the terminal [1], remove the two power supply unit retaining nuts [3] and remove the power supply unit from the insert bezel.
6. Secure the new power supply unit to the insert bezel using the nuts and connect the wiring.
7. Push the insert bezel back into the slot and secure it using the four screws.
8. Install the UV lamp.

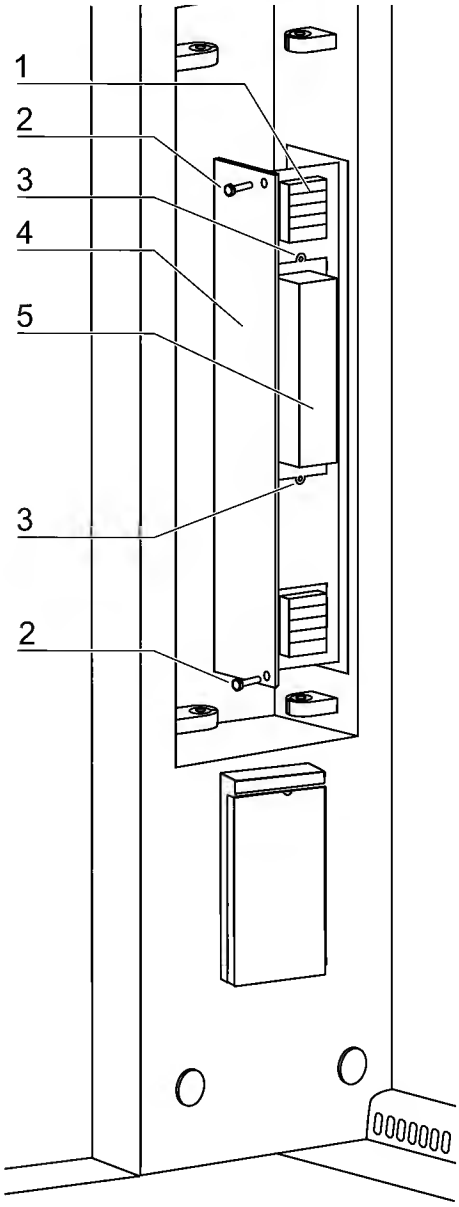


Fig. 12,
UV lamp power supply unit replacement

6. Internal outlets

6.1 Replacing outlets for accesories

Items 80, 90 (outlet)
Item 190 (sealant)

Fig. 13: On both sidewalls of the sample chamber, two outlets [3] (max. overall current 5 A) are installed for the power supply of accessories.

1. Unlock the front door and turn it up.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the two retaining screws [1] that secure the bezel [2] and the outlet [3] to the sidewall.
4. Separate the sealant between sidewall and outlet using a thin blade.
5. Disconnect the wiring from the outlet and remove the outlet [4].
6. Remove any sealant residues from the sidewall. Clean the sidewall; the contact surfaces must be grease- and dust-free.
7. Connect the wiring [4] to the new outlet (see annex C, Wiring Diagrams).
8. Insert the bezel and the outlet into the recess [5] and secure them to the holes [6] at the sidewall using the screws.
9. Seal the joint between sidewall and outlet using sealant.

6.2 Replacing the disinfection adapter

Items 120-160 (disinfection adapter)
Item 190 (sealant)

Fig. 13: Optionally, the sidewall may be equipped with a disinfection adapter [10] for the connection of a mobile UV irradiance unit.

1. Move the front window to the maximal opening position.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the bezel [2], then remove the two retaining screws [11] that secure the disinfection adapter [10] to the sidewall.
4. Separate the sealant between sidewall and disinfection adapter using a thin blade.
5. Disconnect the wiring [9] from the disinfection adapter [10] and remove the disinfection adapter.
6. Remove any sealant residues from the sidewall. Clean the sidewall; the contact surfaces must be grease- and dust-free.
7. Connect the wiring [9] to the new disinfection adapter (see annex C, Wiring Diagrams).

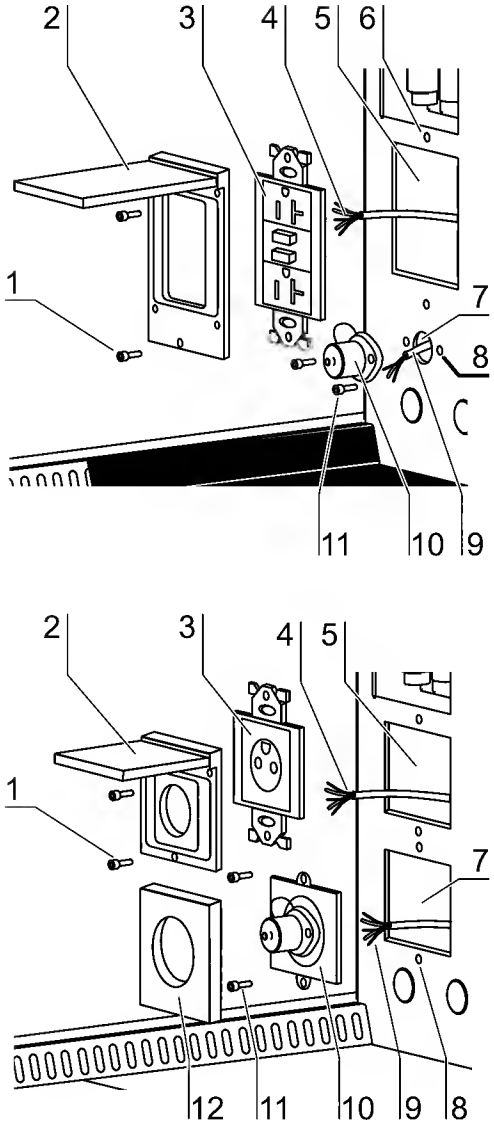


Fig. 13,
Internal outlet replacement

7. Display panel

8. Insert the disinfection adapter into the recess [7] and secure it to the holes [8] at the sidewall using the screws.
9. Seal the joint between sidewall and disinfection adapter using sealant.

7.1 Replacing the display panel foil

Item 750 (display panel foil)

Fig. 14: The display panel labeling is printed onto a self-adhesive foil [4] which is a non-reusable component.

1. Unlock the front door and turn it up.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Warm the foil [4] slightly using a heat gun, then pull it off.
4. Clean the contact surface at the display panel. The surface must be grease- and dust-free.
5. Pull the new foil off the backing, position it at the display panel and rub it on using a soft, clean cloth.

7.2 Replacing the display panel

Item 740 (display panel)

Fig. 14: The display panel [1] is pushed onto bolts at the sample chamber rear panel and sealed with sealant.

1. Unlock the front door and turn it up.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Separate the sealant between display panel and rear panel using a thin blade, then remove the display panel from the bolts.
4. Disconnect the wiring connector.
5. Remove any sealant residues from the rear panel. Clean the rear panel; the contact surfaces must be grease- and dust-free.
6. Clean the display panel surface thoroughly, then attach the self-adhesive display foil [3] onto the display panel [2].
7. Apply a bead of sealant onto the display panel contact surfaces.
8. Connect the wiring connector to the PCB of the new display panel.
9. Push the display panel onto the four bolts at the rear panel.
10. Seal the joint between rear panel and display panel completely using sealant.

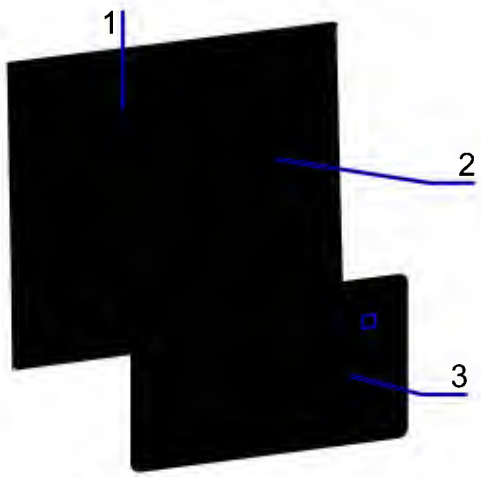


Fig. 14,
Display panel foil replacement

8. Side window

8.1 Replacing the side window

Item 30 (side window)
Item 190 (sealant)
Item 900, 910 (metal shroud)
Item 920 (adhesive tape)

Fig. 15: The side window [1] is secured to the housing frame using sealant.
Use only compound glass for glazing the side window.

1. Turn the front door up.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the workplates from the sample chamber and remove the perforated plate (filter protection) from the sample chamber ceiling (see Section 9.1).
4. Remove the sample chamber cover retaining screw (above the perforated plate projection).
5. Separate the joint at the sample chamber side cover [2] at the housing frame using a thin blade and remove the cover.
6. Separate the joint at the sidemember and at the housing frame around the window.
7. Pull the window rearward out of the sidemember bevel.
8. Clean the sidemember and housing frame edges thoroughly and remove any sealant residues. The contact surfaces of the glass window must be grease- and dust-free.
9. The window must be fixed at several points to ensure that it will not shift when sealed during the installation. Fix the window at the lower edge and at the bevelled edge at several points using double-backed adhesive tape.
10. Push the window into the bevel cover and press it on at the fixing points. Ensure that the window contacts the frame evenly and is not canted.
11. Seal the inner and outer joints at the housing frame first, then position the sample chamber cover [2] , secure it using the screws and seal it on the inside against the housing frame.
12. Remove any excess sealant from the joints.
13. Allow the sealant to cure.

NOTE - Side window material

This installation instruction also applies to side windows that are made of other materials, e.g. polycarbonate or stainless steel.

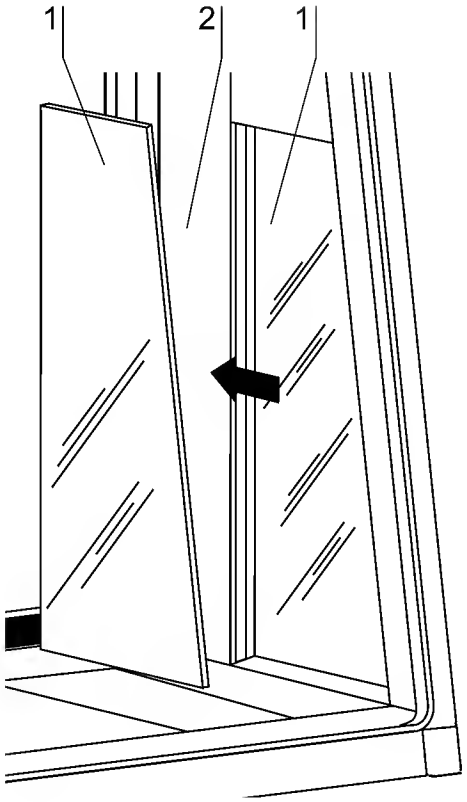


Fig.15,
Side window replacement

9. Filter components

9.1 Filter application

The procedures and measures that have to be considered for filter replacement depend on the application of the device and on the substances processed within the safety cabinet. If toxic substances were processed, the device has to be decontaminated properly prior to any filter replacement. In this case, none of the filters can be reused and must therefore be discarded in accordance with the applicable national regulations for the disposal of special solid waste.
If the device was used for harmless applications (e.g. dust protection), the suction filter can be reused after it has been cleaned.

NOTE - Competence certificate

As filter replacement is regarded as an interference with the safety system of the device, this work must only be carried out by the Technical Service of Kendro Laboratory Products or by specially trained and authorized service personnel.

NOTE - Certificate of nonobjection

If disposal of the device is delegated to a third party, the operator must make sure that this third party is in possession of the applicable licences or permissions. The operator must receive a certificate of nonobjection as a confirmation of proper disposal, including the proper disinfection of the device.

CAUTION - Contamination hazard!

As the safety cabinet can be used for processing infectious substances and materials, the device or device components may become contaminated.

Observe the hygiene regulations of the operator!

- **Wear safety gloves.**
- **Wear safety goggles.**
- **Wear mouth and nose protection to protect the mucous membranes.**
- **Prior to repairs, enquire about potential infection hazards.**
- **Toxic or pathogenic substances or any residues thereof must have been removed completely.**

9. Filter components

- **Prior to inspections or repairs, check to see if the device has been cleaned and disinfected.**
- **Ask the operator for a certificate of nonobjection with indications to the execution of the decontamination measures.**

9.2 Installing/removing the perforated panel (filter protection)

Items 960-990 (perforated panel)
Items 970, 980 (screw with locking)

The perforated panel [5] protects the downflow filter at the sample chamber ceiling [1] from damage and controls the flow behavior of the air that flows from the downflow filter into the sample chamber.
The front end of the panel is attached to several locating pins, the rear end toward the sample chamber rear panel is secured with two screws to the housing frame.

1. **Fig. 16:** Remove the two screws [2], tilt the perforated panel [5] slightly, disengage its front end from the locating pins [3] and remove the panel.
2. To install, align the six holes [4] at the panel front end with the locating pins [3].
3. Secure the perforated panel to the threaded bushings [6] of the panel retainers using the two screws [2].

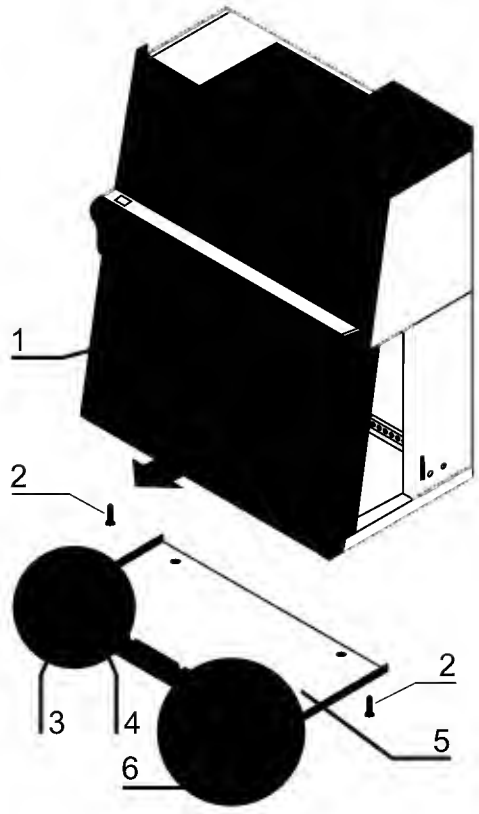


Fig.16,
Perforated panel (filter protection) installation/removal

9.3 Installing/removing the plenum cover

Items 850, 860, 880 (bezel)
Items 340, 350 (gaskets)

The plenum, the filter and blower assembly, is accessible from the front only and concealed by a cover.

1. Lower the front window completely.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the light box shroud as required (see Section 5.1).
4. **Fig. 17:** Two tabs [1] secure the plenum bezel [4] to two threaded sleeves [3] at the upper edge of the device frame. Remove the screws, then remove the bezel.
5. Remove the retaining screws from the cover panel [2] and remove the cover panel.
6. Prior to installing the cover panel, check the flat gasket for damage and replace it as necessary. Clean the contact surfaces at the cover panel and at the device frame, then install the new flat seal using adhesive.

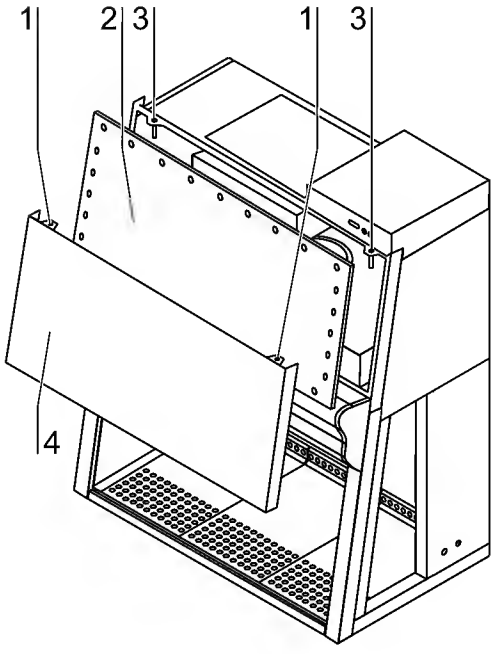


Fig.17,
Plenum cover

9. Filter components

7. Install the cover panel and tighten the retaining screws by hand.
8. Secure the two tabs [1] to the threaded sleeves at the device frame using the screws.

9.4 Replacing the inlet protection (applications in EU / EMEA only)

Item 890 (inlet protection)
Items 1110, 1120 (working plates)

The coarse filter [3] is the inlet protection for the air distribution system. The filter mounting bracket is installed to the sample chamber rear panel [2] below the workplates in the floorpan.

Removing the coarse filter:
1. Remove the workplate(s) from the sample chamber.
2. **Fig. 18:** Have a suited disposal container [3] for the contaminated coarse filter ready.
3. Remove the coarse filter [2] from its mounting bracket [5] and seal it airtight in the disposal container.

Installing the coarse filter:
The coarse filter is supplied as yardware and must be cut to size in accordance with the width **A** of the sample chamber.
4. Cut the coarse filter strip [1] to the required size.
5. Insert the coarse filter into the mounting bracket [5] and make sure that the filter material [3] covers the entire opening surface of the air distribution system at the device rear panel.
6. Install the workplate(s).

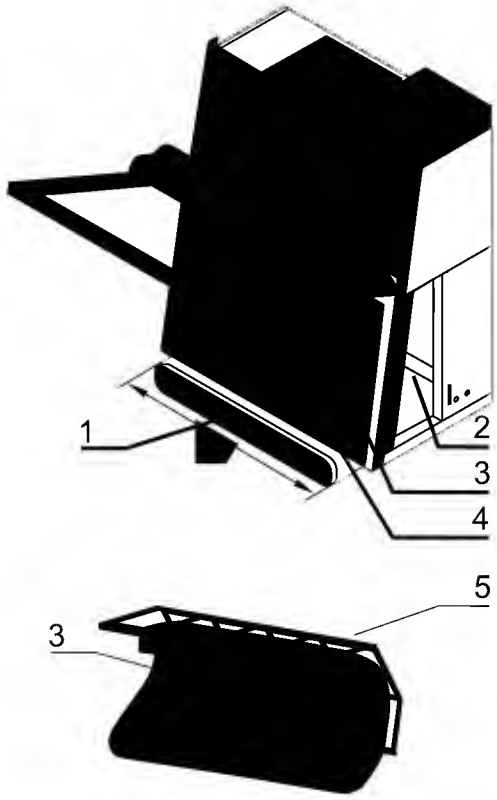


Fig.18,
Coarse filter replacement

9.5 Replacing the exhaust filter

Items 205-235 (pressure frame assy.)
Item 300 (exhaust filter)

Fig. 19: The exhaust filter [2] is located on a frame [4] above the downflow plenum. The housing of the exhaust plenum [1] is supported to the left and right side of the frame by two guide rails and can be removed from the device plenum chamber by pulling it forward.

1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Remove the plenum cover (see Section 9.2).
3. The three retaining tabs of the exhaust blower are secured with three tabs and screws to the exhaust plenum housing (see Fig. 21). Remove the two screws, disconnect the exhaust blower [5] from the exhaust plenum and place it onto the downflow plenum.

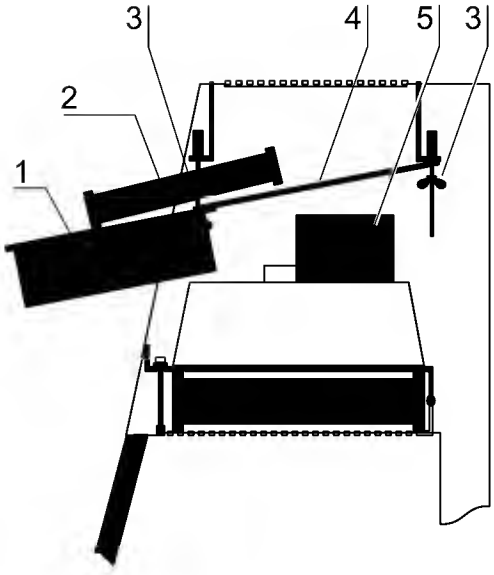


Fig. 19,
Exhaust filter replacement

9. Filter components

4. The exhaust plenum frame suspends from the device ceiling on four threaded rods [3]. Loosen the thread rod wing nuts so that the frame is slightly lowered.
5. Disconnect the air hose.
6. Pull the exhaust housing [1] forward out of the plenum.
7. Loosen the two front wing nuts so far that the exhaust filter [2] can be removed from the frame.
   Discard the exhaust filter properly.
8. Check to see if the gasket of the replacement filter is OK. Insert the replacemenet filter into the frame so that the side with the filter description is visible.
9. Lift the exhaust plenum frame and push the plenum all the way into the plenum chamber. Tighten the wing nuts alternately. The filter gasket must be flush with the exhaust duct upper frame and with the exhaust plenum frame.
10. Install the exhaust blower into the exhaust plenum and secure it to the housing using the two screws.
11. Install the plenum bezel and cover (see Section 9.2).

9.6 Replacing the downflow filter

Item 290 (downflow filter)
Item 250 (pressure profile)
Item 205 (screws)

Fig. 20: The downflow filter [3] is located below the downflow blower plenum. It has a hinge [4] at its back and can be swivel upward with the blower after the exhaust plenum has been removed (see Section 9.4)

1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Remove the plenum bezel and cover (see Section 9.2).
3. Remove the downflow plenum [1] retaining screws [2].
4. Remove the pressure profiles, lift the downflow plenum, then pull the downflow filter [3] forward and discard it properly.
5. Insert the new filter so that the side with the filter description is visible. Check to see if the filter gasket is OK.
6. Install the pressure profiles and secure them using the retaining screws. The filter gaskets must be flush with the lower sealing frame [1] and with the downflow plenum frame [2].
7. Install the plenum bezel and cover (see Section 9.2).

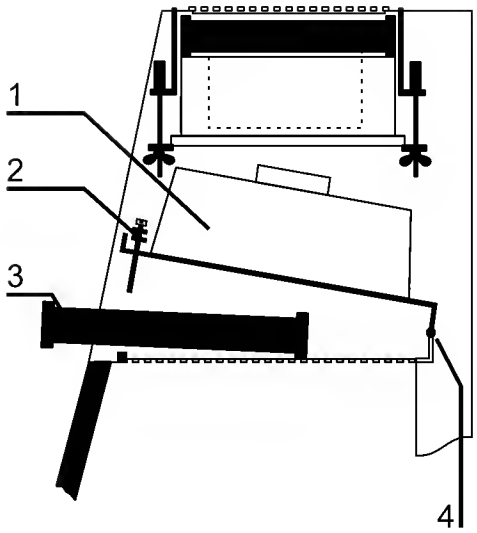


Fig.20,
Downflow filter replacement

10. Blowers

10.1 Replacing the exhaust blower

Item 200 (exhaust blower)
Item 205 (screw)

Fig. 21: The exhaust blower [1] is secured with three tabs and two screws to the exhaust plenum housing [4].

1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Remove the plenum cover and bezel (see Section 9.2).
3. Disconnect the blower wiring and remove it from the control box.
4. Remove the two retaining screws [3] and remove the exhaust blower from the exhaust plenum housing [4].
5. Install the exhaust blower [1] into the exhaust plenum housing so that the housing wallpanel is setaed between the three tabs [2].
6. Secure the exhaust blower to the housing ueing the two screws.
7. Route the wiring through the recesses to the control box and connect it. Make sure that the lead-in seals are tight in the recesses.
8. Install the plenum cover and bezel using the screws (see Section 9.2).

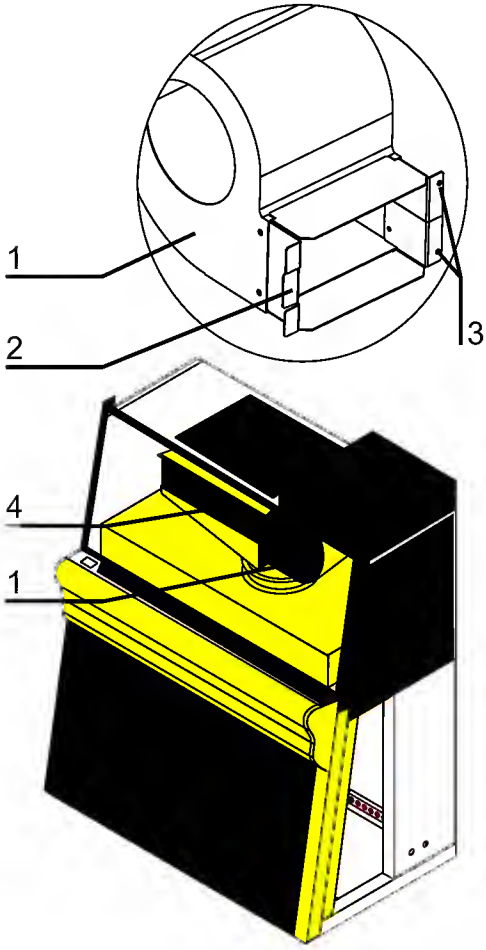


Fig.21,
Exhaust blower replacement

10. Blowers

10.2 Replacing the downflow blower

Item 240 (downflow blower)

Fig. 22: The downflow blower [2] is mounted to a crossmember [7] in the downflow plenum [1].

1. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
2. Remove the plenum cover and bezel (see Section 9.2).
3. Disconnect the blower cable and remove it from the control box.
4. Remove the downflow filter and the exhaust filter (see Sections 9.4/9.5).
5. Swivel the downflow plenum upward, remove the four retaining screws [5] from the threaded sleeves [4] and remove the blower/crossmember assembly from the plenum.
6. Secure the new blower to the crossmember using the four retaining screws [6] and install the crossmember to the inner side of the downflow plenum.
7. Install the downflow filter and the exhaust filter (see Sections 9.4/9.5).
8. Route the cable through the recesses [3] to the control box and connect it. Make sure that the cable lead-in seals are tight in the recesses.
9. Install the plenum cover and bezel using the screws (see Section 9.2).

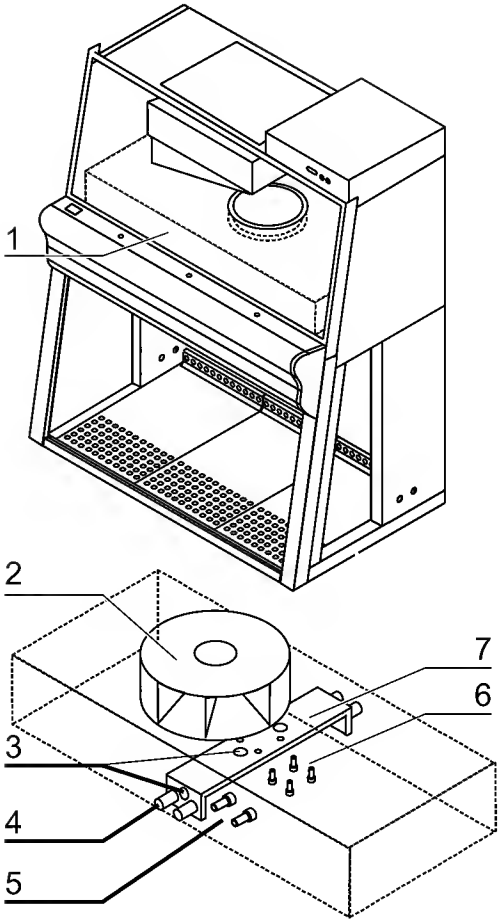


Fig. 22,
Downflow blower replacement

11. Pressure sensors

11.1 Replacing pressure sensors

Item 260 (pressure sensor)
Item 270 (test hose plug)
Item 280 (label set, Exhaust/Supply)
Item 990 (hose)

Fig. 23: The pressure switches for the exhaust air [5] and for the downflow air [2] are installed to a plate at the the plenum ceiling [9].

1. Remove the plenum cover (see Section 9.2).
2. Disconnect the connecting cable [1] and the air hoses [6] and [7].
3. The pressure sensors are merely inserted into the mounting [3] and must be lifted for removal.
4. Insert the new pressure sensor sensor into the mounting, connect the exhaust air hose [6] to the connecting sleeve [5] and the downflow air hose [7] to the connecting sleeve [8].
5. Connect the connecting cable connector to the plug-in contacts.
6. Install the plenum bezel and cover (see Section 9.2).

NOTE - Cable/hose assignment

Make sure that the hoses and cables are connected properly to the pressure sensors. The hoses are always connected to P1 at the sensor.

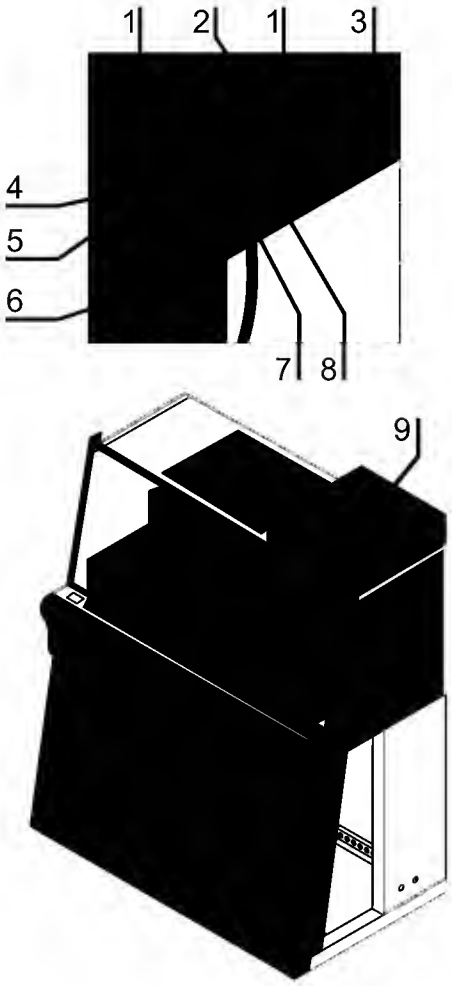


Fig. 23,
Pressure sensor replacement

12. Front door components

12.1 Replacing the front door assembly

Item 370 (sleeve)
Item 380 (hinge bolt)
Item 390 (retaining washer for hinge)

Fig. 24: The hinge bolts secure the front door [2] to the two hinges [1] of the device frame. The hinge bolts are offset and installed from the inside out into the hinge. To remove the front door, the wiring must be disconnected from any component installed to the front door mounting frame.

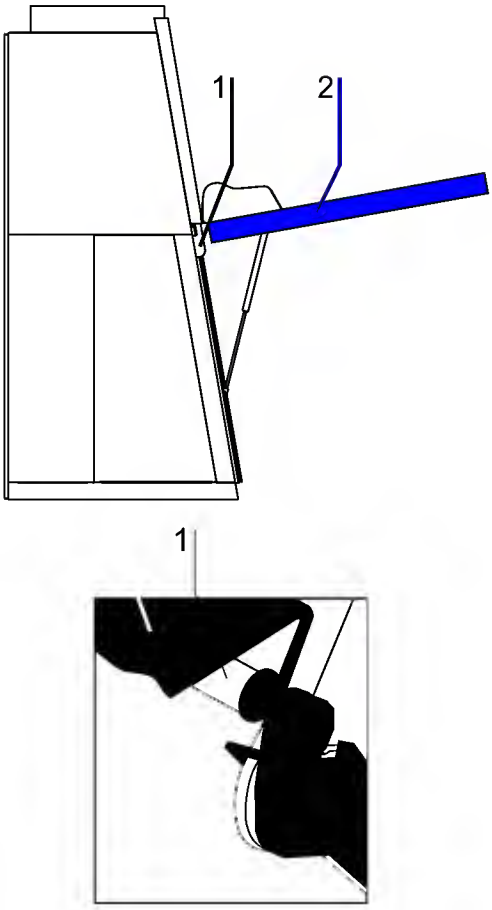


Fig. 24,
Front door hinge

NOTE - Front window

To remove the front door, the front window must always be removed first (see Section 12.2).

Removing the front door:

1. Lower the front window all the way.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the plenum bezel (see Section 9.2).
4. Remove the light box shroud (see Section 5.1).
5. Remove the two luminescent tubes (see Section 5.1).
6. Disconnect the wiring from any component installed to the mounting frame and mark the cable assignment to the individual components.

NOTE - Front door position switches

The switches at the hinge may warp when the front door is removed. Remove the switches (Fig. 34, [3] and [4]).

NOTE - Front door weight

The front door/window assembly is very heavy! The front door must be supported before the hinge bolts are removed from the hinge.

NOTE - Gas struts

Before the bolts can be removed from the hinge, the gas struts on both sides of the front door must be removed as otherwise the strut pressure will press the front door away from the housing frame.

12. Front door components

7.Remove the two gas struts (see Section 12.2).
8. **Fig. 25:** Remove the front door side covers. The covers are secured with screws to the frame and to the lower cross-member [1].
9. Remove the front window (see Section 12.2).
10. The hinge bolts [3] are secured to the hinge [2] with circlips [3]. Remove the circlips and remove the hinge bolts inwards from the hinge.
11. Remove the front door.

Installing the front door:
1. Place the front door onto the device frame and push the two hinge bolts from the inside out into the hinge.
2. Secure the hinge bolts on both sides using the circlips.
3. Install the front window (see Section 12.2).
4. Install the two gas struts (see Section 12.2).
5. Connect the wiring of the front door electrical components to the mounting frame.

NOTE - Cable routing

When routing the cables, make sure that they are not subjected to tensile forces when the front door is opened. The routing must ensure that the cables will not be trapped or damaged by mechanical components.

5. Check the traveling motions of the front window using the pilot switch (not the remote control).
6. Secure the front door side covers using the screws.
7. Install the light box shroud (see Section 5.1).
9. Install the plenum bezel (see Section 9.2).

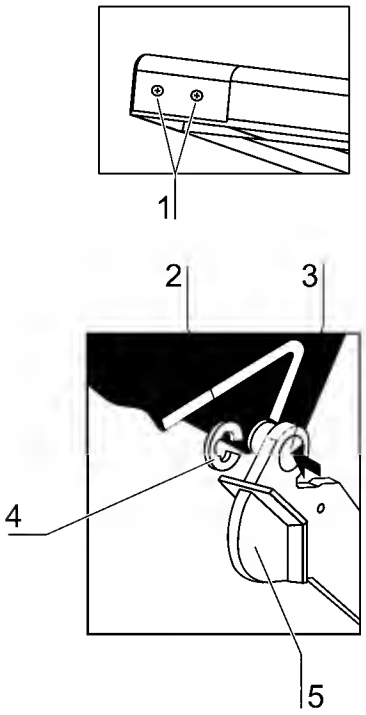


Fig. 25,
Hinge bolt removal

12. Front door components

12.2 Replacing the gas strut

Item 720 (gas strut complete)

Fig. 26: Each of the upper and lower retaining bolts [1] of the gas strut is secured with a spring clip [2].

1. Unlock the bolt, remove the spring clip from the gas strut base [3] and push the bolt from the inside out of the mounting. Remove the gas strut.

NOTE - Gas strut alignment

The gas strut pressure cylinder must be facing upward.

2. To install, insert the gas strut into the front door mounting. From the inside, insert the bolt outward into the mounting and secure it using the spring clip, then install the gas strut linkage to the housing frame mounting.

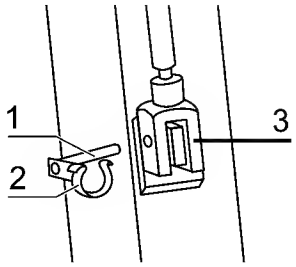


Fig. 26,
Gas strut removal

12.3 Replacing the front door seal

Item 360 (Front door seal)

Fig. 27: If the front door seal [1] shows visble signs of wear, the seal must be replaced.
The seal is merely pushed onto the device frame and is secured additionally at the upper and lower side of the sample chamber opening by a retaining rail.

1. Remove the retaining screws [2] and remove the retaining rail [3].
2. Pull the seal [1] off the retaining lip at the device frame.
3. Push the groove of the replacement seal onto the retaining lip and press the seal on to ensure that it is positioned flush along the entire length of the contact surface.
4. Secure the retaining rail using the screws.

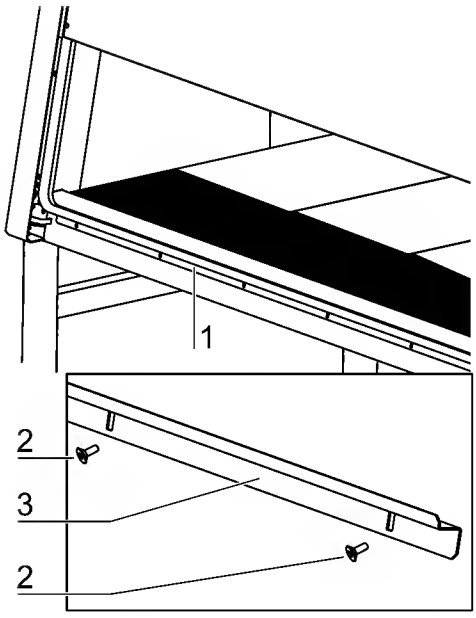


Fig. 27,
Front door seal replacement

12. Front door components

12.4 Replacing the front frame latch

Item 400 (front frame latch)
Items 640, 650 (cable retainer)

The latch is secured to the front door with two screws.

1. Lower the front window all the way.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the front door side covers. The covers are secured with screws to the frame and to the lower crossmember (see Fig. 25/29).
4. Remove the crossmember (see Fig. 27).
5. **Fig. 28:** Remove the retaining screws [1], then remove the latch.
6. Connect the connecting cable to the new latch.
7. Position the latch housing at the frame and secure it using the screws.
8. Install the crossmember.
9. Install the front door side covers.

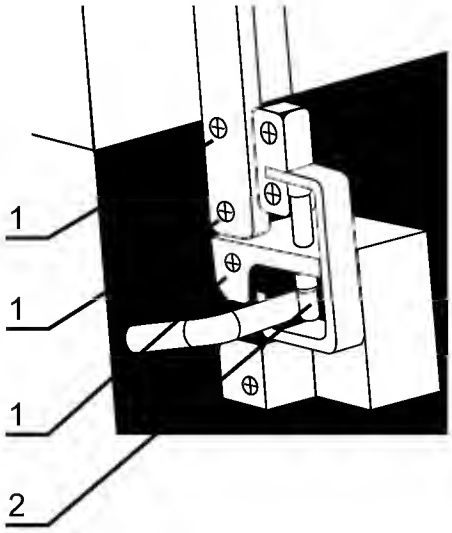


Fig. 28,
Front frame latch

12.5 Replacing the front window

Item 700 (front window)
Items 640, 650 (cable retainer)

The front window [4] is removed forward or downward from the front door frame.

Removing the front window:

1. Lower the front window all the way.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the plenum bezel (see Section 9.2).
4. Remove the light box shroud (see Section 5.1).
5. Remove the following position switches (Section 12.7, Fig. 34):
   - front window closed [7]
   - work opening [8]
   - reduced ventilation [9]
6. **Fig. 29:** Remove the front door covers [3]. The covers are secured with screws to the lower crossmember [2] at the side of the frame and at the corner [2].

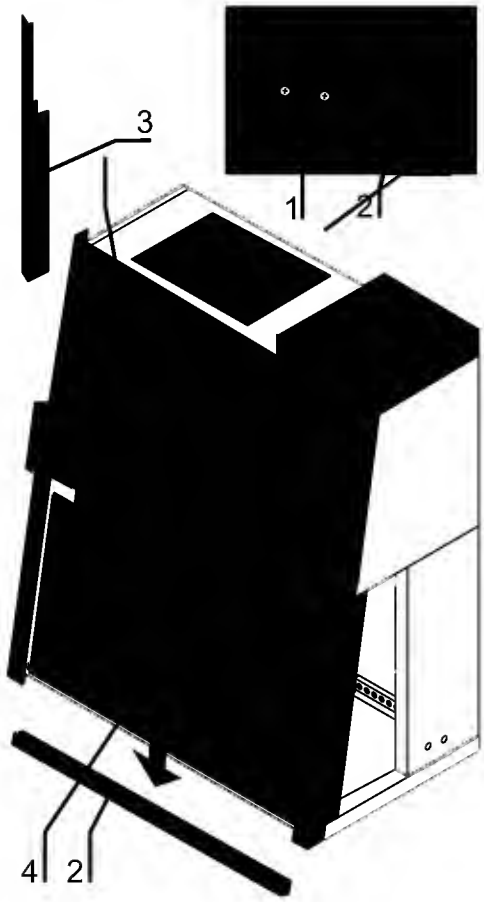


Fig. 29,
Front window removal

12. Front door components

NOTE - Front window support

To prevent the accidental separation of the front window from the frame, the window must be supported from below before the two cable rateiners are removed.

8. **Fig. 30:** Remove the cable retainers [2] on both sides of the front window. Remove the nuts [4] and remove the cable retainer from the recess [3] on the frame.
9. Disconnect the cable [1] from the cable retainer guide slot [2].
10. Loosen one retaining screw of the switch **Window final point** (see Section 12.7) and rotate it out of the way to ensure that the switch lever will not be damaged when the window is removed.
11. Use suction cups with handles to pull the window forward or downward off the frame.

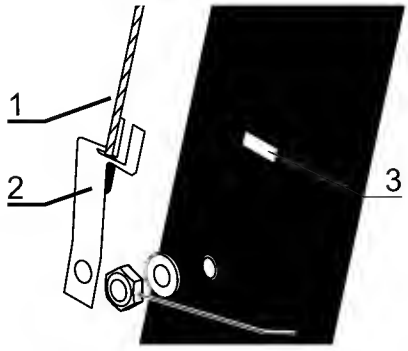


Fig. 30,
Cable retainer

Installing the front window:

12. Push the new window from the front into the frame.
13. Connect the cables to the cable retainers on both sides. Insert the tab into the recess [3] on the frame and secure the retainer using the screw.
14. Install the side covers.

12.6 Adjusting the front window

The front window is self-adjusted by the tension of the window drive [2].

1. **Fig. 31:** Loosen the motor mounting bracket [3] at the mounting frame. Loosen the four retaining screws [1] so far that the retainer is free to move.

NOTE - Traveling motion control

During the adjustment, use only the the pilot switch to control the traveling motions.

When failures occur, the traveling motion may not be controllable using the remote control so that the front window may collide with other components.

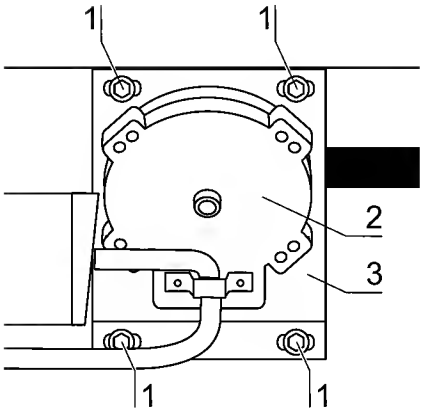


Fig. 31,
Window drive mounting bracket

12. Front door components

WARNING – High voltage!

Contact with current-carrying components may cause a lethal electric shock.

To test the traveling motions, the device must be connected to the power supply system with the protective covers removed. Observe electrical safety regulations!

- **Wear protective gloves.**
- **Use only approved electrical tools for the adjustment.**

2. Move the window up temporarily using the pilot switch.
3. Secure the motor mounting bracket using the screws.
4. Check the traveling motion of the window for possible sources of collision or friction by raising and lowering the window.

12. Front door components

12.7 Adjusting the switch points

Items 660-690 (switch actuator set)
Items 610-630 (position switch)
Item 1250 (PCB)

Device functions that depend on individual front window positions are controlled by position switches. The position switches are initialized by switch contacts on the front window.

Checking the stop and function contacts:

1. Use the pilot switch to move the window to the individual working positions.
2. The position switches are secured with screws to a pivot point and to a slot on the mounting frame. Loosen both screws and reposition the switch to adjust the switching points.
3. **Fig. 33:** Upon closing contact (traveling motion stops), the left and right bearings [1] must be seated completely in the recesses of the upper guide rails [2] (installed to the plenum cover panel).
4. Check the constant direction of travel of the front window and the stop positions repeatedly along the entire length of the guide rails.
5. Install the two luminescent tubes.
6. Install the front door side covers, the light box shroud, and the plenum bezel.

Fig. 34: Switching functions of the position switches:
[1] Front door position monitoring
[2] Slack cable monitoring left
[3] Slack cable monitoring right
[4] Front door position monitoring (KS 15 and KS18 only)
[5] Front window max. opening position (software)

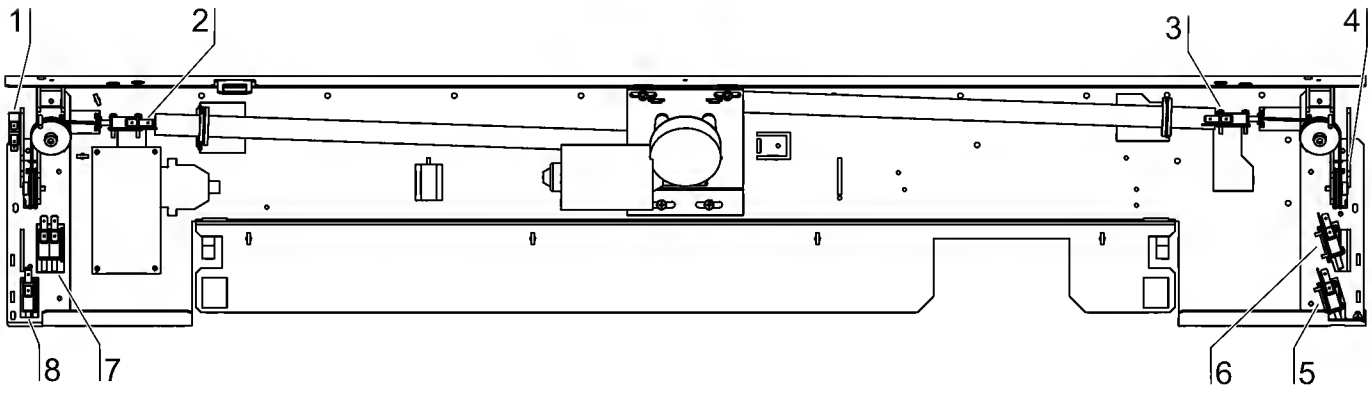


Fig. 32,
Position switches

12. Front door components

[6] Front window max. opening position (power supply)
[7] work opening
[8] Reduced ventilation

12.8 Replacing the front window drive

Items 480-550 (window drive)
Item 450 (grommet)
Items 460, 470 (deflection roller)
Items 560-600 (stainless-steel cable)
Item 1260 (cable control)

Fig. 34: The front window drive is supplied as an assembly that consists of motor [6] and transmission [3].

Removing the window drive:

1. Lower the front window all the way.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the light box shroud (see Section 5.1).
4. Disconnect the motor wiring.
5. Remove the motor mounting bracket [5] from the mounting frame. Remove the four retaining screws [1] so that the cable reel can be separated from transmission and motor from the rear of the mounting bracket.
6. Remove the cable reel guard. Twist the metallic tabs [2] with pliers to release them from the recesses in the motor mounting bracket.
7. The left and right cables of the front window are secured with screws [14] in the reel. To remove the cable, remove the screws.
8. Remove the circlip [9] from the transmission shaft and remove the cable reel from the shaft [13].
9. Remove the three retaining screws [11] of the transmission [6] and remove the motor/transmission assembly from the motor mounting bracket [5].

Installing the window drive:

10. Position the new motor/transmission assembly at the motor mounting bracket and install the three retaining screws [11] from the rear of the mounting bracket.
11. Insert the key [12] into the shaft spline and slide the cable reel onto the shaft.
12. When installing and securing the cables, make sure to install the right cable to the rear guide and the left cable to the front guide of the cable reel. Secure the cables with the screws to the cable reel.
13. Install the circlip [9] to the shaft.

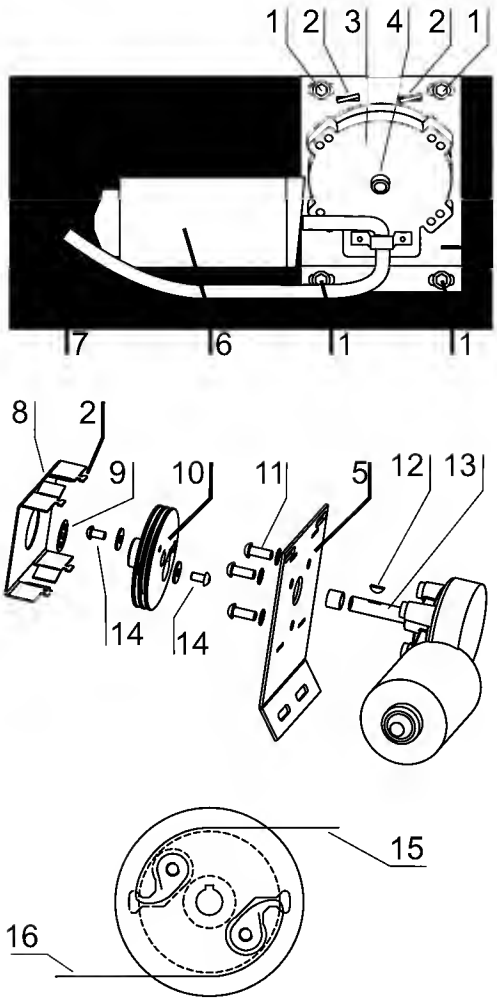


Fig. 34,
Window drive replacement

12. Front door components

14. Secure the cover with the screws.
15. Install the guard to the mounting bracket and twist the tabs [2] with pliers so that the guard is attached tightly to the motor mounting bracket [5].
16. Install the motor mounting bracket to the mounting frame and secure it with the screws.
17. Connect the motor wiring.
18. Adjust the front window (see Section 12.6).

12.6 Replacing the pilot switch

Item 770 (pilot switch)

1. Lower the front window all the way.
2. Switch the device off, disconnect it from the power supply system, and protect it from accidental reconnection.
3. Remove the light box shroud (see Section 5.1).
4. Disconnect the connecting cable.
5. The switch is merely clipped into the mounting frame and can be removed upward.
6. Press the switch into the mounting frame so that it snaps in. Connect the wiring and check the switch for correct operation.
7. Install the shroud using the screws.

13. Control box components

13.1 Replacing control box electrical components

Item 1060 (switchbox cover)
Item 1190 (master PCB)
Items 1200-1210 (power supply units)
Item 1240 (fuses)
Item 1400 (sockets for potential-free contact)

Items 1230, 1260 (fuse holder)
Item 1220 (terminal strip)
Items 1280-1320 (wire sets)
Items 1330, 1340 (capacitor, diode)
Item 330 (power supply cables)
Item 280 (cable retainer)

Fig. 35:
The control box [1] is installed to the device ceiling. The control box cover [1] is secured with 4 screws.
The power supply units (230 V/115 V) are installed to the master board:

- KS 15 and KS 18 are equipped with two power supply units [3] and [4].
- KS 9 and KS 12 are operated with one power supply unit [7].

The face of the control box has an RS 232 connector [5] and the two fuses [6] for the device-integral power supply.

▶ Application in USA/Canada: UL 3101-1:
Power supply connection 120 V ~ / PE 60 Hz
On-site protection T1 5A

▶ Application in EU: IEC 1010-1 / EN 61010-1:
Power supply connection 230 V ~ / PE 50 Hz
On-site protection T1 6A

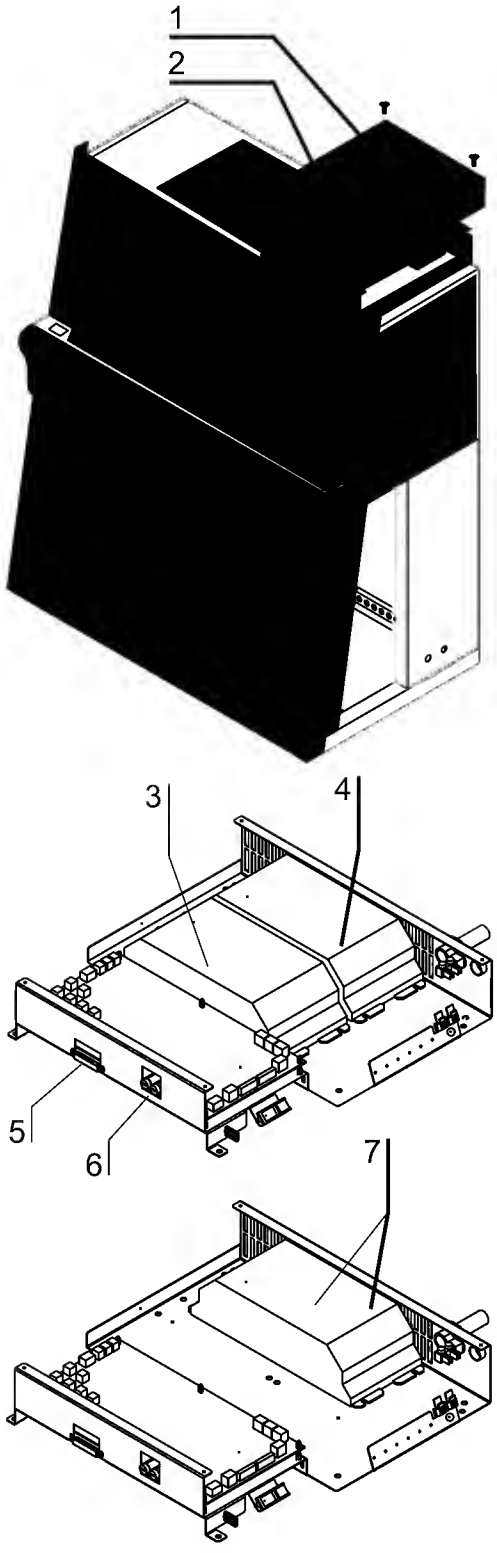


Fig. 35,
Control box electrical components

14. Device control programming

14.1 Setting the remote control

Item 1060 (remote control battery)
Item 1070 (remote control)
Item 1080 (remote control mounting)
Item 1090 (suction cup)
Item 1100 (protective cover)

Navigation along the functional levels of the service software is only possible after the IR address of the remote control has been set to **0 (Master)**.

Setting the IR address:

1. **Fig. 36:** Open the lid [3] of the battery compartment at the bottom of the remote control by introducing a pointed instrument into the notch [1].
2. Check to see if the code switch [2] is set to position **0**. If not OK, rotate the switch to this position.
3. Insert the two lid hinges into the battery compartment joints and press the lid slightly on so that the retaining clip engages.

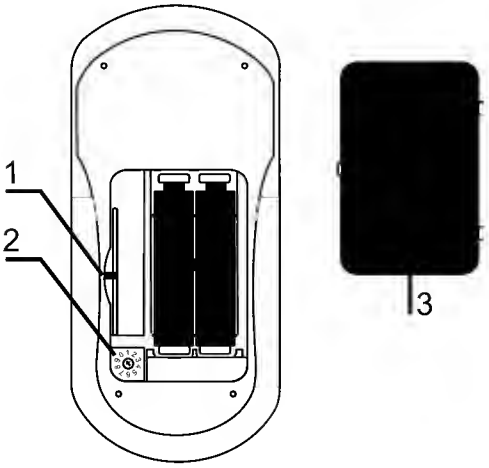


Fig. 36,
Remote control IR address setting

NOTE – Value reset

After the programming has been completed, reset the code switch to the original value (see Service Level, Submenu S12).

14.2 Program structure

The device control configuration is laid out in two programming levels:

- Service level with 12 submenus (S01-S14)
- Parameter level with 26 submenus (P01-P26)
- Disinfection level with 7 submenus (D01-D07)

Service levels
Use the service level for settings that relate to the security functions of the device. The behavior of the functional units for the protection of property and for the safety of the personnel can be altered within the specified value ranges.
Parameter level
Use the Parameter level for setting the basic configuration of the device control. Functions can be enabled or disabled, control parameters can be set.

14. Device control programming

14.3 Service level

The service software consists of 14 functional levels. Each level addresses one specific device function by changing and saving the pertaining parameter values.

NOTE – Alarm signals

No audible signals are issued during programming on the service level.

14.3.1 Service level overview

Overview of the available service level functions and of the pertaining specified value ranges.

Level	Function	Values
S01	Set nominal value for downflow blower	1 - 100 %, Setting see Section A
S02	Set nominal value for exhaust blower	1 - 100 %, Setting see Section A
S03	Set downflow velocity alarm limit	1 - 100 %, Setting see Section A
S05	Set inflow velocity alarm linit	1 - 100 %, Setting see Section A
S07	Display total operating hours in h/10)	-
S08	Display and reset time after most recent filter replacement	Reset to 0 only after filter replacement
S09	Display and reset operating hours for UV operation	Reset to 0 only after tube replacement
S10	Downflow nominal setpoint USA (feet/min) / EMEA (m/s)	75 (70)* / 0.36
S11	Inflow nominal setpoint USA (feet/min) / EMEA (m/s)	105 / 0.45
S12	Remote control IR adddress	1
S13	KI disk, measured number of points	5
S14	Time in minutes before reaching nominal pressure values	2

*Note device nameplate
For parameter lists for setting the value ranges, please refer to the Annex.

14. Device control programming

14.3.2 Service level settings

Fig. 37: The service levels are requested from the operator level. The display panel [1] shows the current state of navigation as an alphanumeric combination (S indicates the service level, 01 indicates the first of 14 functional levels).
When the value input of a service level is activated, the previously set value [2] flashes on the display panel.

1. To go from the operator level to the service level:

   Keep the (I I) key depressed for approx 10 seconds

   The ready signal sounds. You are now on the first functional level of the service level, S 01.

2. To scroll through service levels:

   Press, then release the ▲ or ▼ key

3. To activate the value input of a service level:

   Press the SEt key

   The preset value flashes.

4. To change a value in increments:

   Press, then release the ▲ or ▼ key

5. To scroll through displayed values:

   Press, then release the ▲ or ▼ key

   If the keys are depressed for approx 2-3 seconds, the scroll speed increases automatically.

6. To save the input value:

   Press the SEt key

   If the setting is not saved, the input is reset to the original value after approx 15 minutes.

7. To return from the service level to the operator level:

   Press the (I I) key

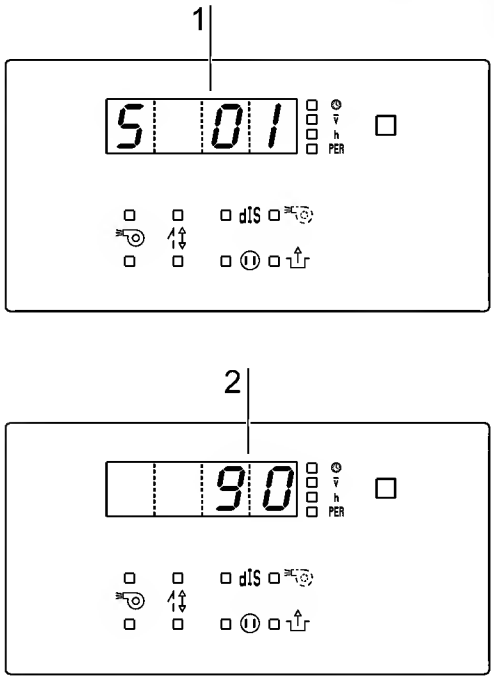


Fig. 37,
Service level display

14. Device control programming

To save input values for S1, S2, S3, and S5 (version 1.07 or higher):

Press the SEt key

Change the value (if the value remains unchanged, the timer elapses backward, after approx 1 minute the display shows SEt)

Press the SEt key again

14.4 Parameter levels

The parameter software consists of 26 functional levels. Each level is used to set a specific device configuration by setting the corresponding switches or by changing and saving parameter values.

NOTE – Alarm signals

No audible signals are issued during programming on the service levels.

14.4.1 Parameter level overview

Overview of the available functions of the parameter levels and of the pertaining switching options or specified value ranges for making these settings.

Level	Function	KS 9	KS 12	KS 15	KS 18
P01	Software version	2			
P02	Parameter ID	see "Configuration identifier overview"			
P03	Window type	0			
P04	UV lamp/socket No (0) or Yes (1)	0 or 1, depending on device type			
P05	External consumer available No (0) or Yes (1)	0			
P06	Monitor alarm available No (0) or Yes (1)	1			
P07	Audible alarm can be silenced No (0), Yes (1) or no audible alarm (2)	0 (1)			
P08	Air velocity unit USA (feet/min) 1 or EMEA (m/s) 0	1 / 0			
P09	Control voltage for reduced downflow	30			
P10	Control voltage for reduced inflow	30			
Application in USA/Canada					
P13	Blower Performance Factor Offset		30		10
P14	Blower Performance Factor Window		10		8
Application in EU / Middle East / Africa					
P13	Blower Performance Factor Offset	0			
P14	Blower Performance Factor Window	100			

14. Device control programming

Ebene	Function	KS 9	KS 12	KS 15	KS 18
P15	Silenced alarm repeated after 0 – 60 Minuten	0			
P16	Holding time for key press code in seconds	5			
P17	Duration in minutes for automatic return from service level	15			
P19	Downflow velocity increase display	-			
P21	Audible signal after P 16 elapses for 0 – 1000 m/s	300			
P22	Reset total operating hours h/10 display	Carry-over upon PCB replacement			
P23	Audible alarm delay for timer start	25			
P24	Downflow blower limit value	50	50	50	25
P25	Current limit for window motor up in	02. Mai			
P26	Current limit for window motor down in A	02. Mai			
P27	Auto alarm limit	150			

14. Device control programming

14.4.2 Parameter level settings

Fig. 38: The parameter levels are requested from the service level. The display panel [1] shows the current state of navigation as an alphanumeric combination (P indicates the parameter level, 01 indicates the first of 23 functional levels).
When the value input of a parameter level is activated, the previously set value [2] flashes on the display panel.

1. To go from the operator level to the service level:

   Keep the (I I) key depressed for approx 10 seconds

   The ready signal sounds. You are now on the first functional level of the service level, S 01.

2. To go from the service level to the parameter level:

   Keep the ☼ key depressed for approx 10 seconds

   The ready signal sounds. You are now on the parameter level P 01.

3. To scroll through parameter levels:

   Press, then release the ▲ or ▼ key

4. To activate the value input of a parameter level:

   Press the SEt key

   The set value flashes.

5. To change a value in increments:

   Press, then release the ▲ or ▼ key

6. To scroll through displayed values:

   Press the ▲ or ▼ key

   If the keys are depressed for approx 2-3 seconds, the scroll speed increases automatically.

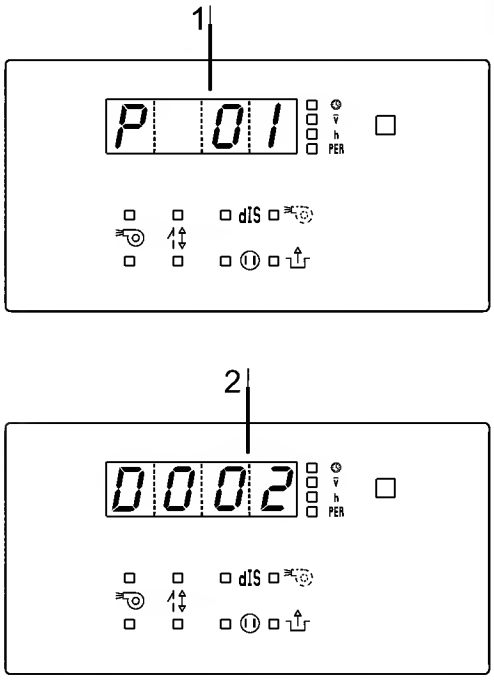


Fig. 38,
Parameter level display

14. Device control programming

7. To save the input value:

   Press the SEt key

   If the setting is not saved, the input is reset to the original value after approx 15 minutes.

8. To return from the parameter level to the operator level:

   Press the ☼ key

14.4.3 Configuring the switching states of a device control

The configuration of a device control can be displayed by reading the parameter ID. This ID is a combination of one letter and three numbers, e.g. **D421.**

Parameter ID breakdown:
D Configuration setting state
4 the first number indicates the device type
21 the other two numbers are the configuration identifier

Device type:
The device type can be identified by the sample chamber width (in feet):
3 = KS 9
4 = KS 12
5 = KS 15
6 = KS 18

Configuration identifier:
The configuration identifier indicates the device control layout by the switching state setting (true/false or on/off). The device control offers a total of 60 possible configuration identifiers that are set in the parameter levels P 03, P 04, P 05, P 06, P 07, and P 08. The switching states for the individual configuration identifiers are set as described in the following table.

14. Device control programming

D421, for example, breaks down as follows:
In accordance with the factory setting **(D)**, a safety cabinet KS 12 **(4)** for the configuration identifier **21** has the following switching states:
P 03 = 1
P 04 = 0
P 05 = 1
P 06 = 0
P 07 = 1
P 08 = 1

Configuration identifier overview

Identifier	P03	P04	P05	P06	P07	P08
01	1	1	1	1	1	1
02	1	1	1	1	1	0
03	1	1	1	1	0	1
04	1	1	1	1	0	0
05	1	1	1	0	1	1
06	1	1	1	0	1	0
07	1	1	1	0	0	1
08	1	1	1	0	0	0
09	1	1	0	1	1	1
10	1	1	0	1	1	0
11	1	1	0	1	0	1
12	1	1	0	1	0	0
13	1	1	0	0	1	1
14	1	1	0	0	1	0
15	1	1	0	0	0	1
16	1	1	0	0	0	0
17	1	0	1	1	1	1
18	1	0	1	1	1	0
19	1	0	1	1	0	1
20	1	0	1	1	0	0
21	1	0	1	0	1	1
22	1	0	1	0	1	0
23	1	0	1	0	0	1
24	1	0	1	0	0	0
25	1	0	0	1	1	1
26	1	0	0	1	1	0
27	1	0	0	1	0	1
28	1	0	0	1	0	0
29	1	0	0	0	1	1
30	1	0	0	0	1	0
31	1	0	0	0	0	1
32	1	0	0	0	0	0

Identifier	P03	P04	P05	P06	P07	P08
33	0	1	1	1	1	1
34	0	1	1	1	1	0
35	0	1	1	1	0	1
36	0	1	1	1	0	0
37	0	1	1	0	1	1
38	0	1	1	0	1	0
39	0	1	1	0	0	1
40	0	1	1	0	0	0
41	0	1	0	1	1	1
42	0	1	0	1	1	0
43	0	1	0	1	0	1
44	0	1	0	1	0	0
45	0	1	0	0	1	1
46	0	1	0	0	1	0
47	0	1	0	0	0	1
48	0	1	0	0	0	0
49	0	0	1	1	1	1
50	0	0	1	1	1	0
51	0	0	1	1	0	1
52	0	0	1	1	0	0
53	0	0	1	0	1	1
54	0	0	1	0	1	0
55	0	0	1	0	0	1
56	0	0	1	0	0	0
57	0	0	0	1	1	1
58	0	0	0	1	1	0
59	0	0	0	1	0	1
60	0	0	0	1	0	0
61	0	0	0	0	1	1
62	0	0	0	0	1	0
63	0	0	0	0	0	1
64	0	0	0	0	0	0

14. Device control programming

14.5 Disinfection levels

The disinfection commands are used for controlling a disinfection routine with formaldehyde. It consists of 7 functional levels. On each level, a specific setting for the disinfection routine can be made by changing and saving the parameter values.

NOTE – Accessories

The disinfection routine must only be activated if a utility for vaporizing the two chemicals is available whose power supply can be switched directly by the safety cabinet control unit.

14.5.1 Disinfection level overview

Overview of the available functions of the disinfection levels and of the pertaining specified value ranges for making these settings.

Level	Function	Value range
D02	Formaldehyde reaction time	0
D03	Ammonia reaction time	0
D04	Front window up, time in seconds	0
D05	Exhaust blower output	0
D06	Downflow blower output	0
D07	Ventilation time in hours	0

Parameter lists for adjusting of the value ranges are attached as appendix.

14. Device control programming

14.5.2 Disinfection level settings

Fig. 39: The disinfection levels are requested from the service level. The display panel [1] shows the current state of navigation as an alphanumeric combination (D indicates the disinfection level, 01 indicates the first of 7 functional levels).
When the value input of a disinfection level is activated, the previously set value [2] flashes on the display panel.

1. To go from the operator level to the service level:

   Keep the (I I) key depressed for approx 10 seconds

   The ready signal sounds. You are now on the first functional level of the service level, S 01.

2. To go from the service level to the disinfection level:

   Keep the dIS key depressed for approx 10 seconds

   The ready signal sounds. You are now on the disinfection level D 01.

3. To scroll through disinfection levels:

   Press, then release the ▲ or ▼ key

4. To activate the value input of a disinfection level:

   Press the SEt key

   The set value flashes.

5. To change a value in increments:

   Press, then release the ▲ or ▼ key

6. To scroll through displayed values:

   Press the ▲ or ▼ key

   If the keys are depressed for approx 2-3 seconds, the scroll speed increases automatically.

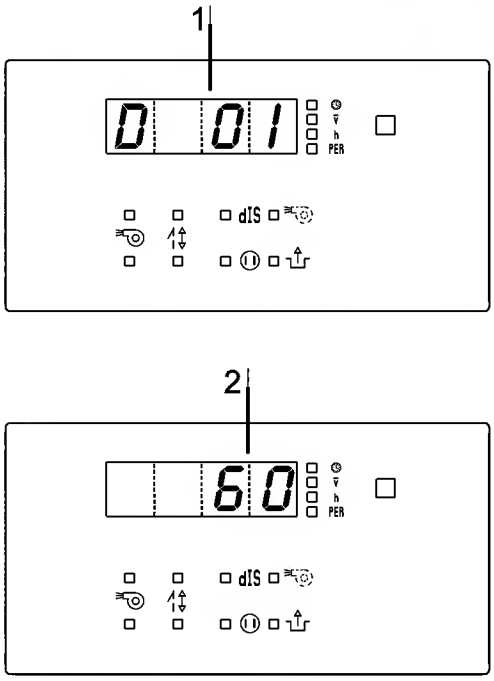


Fig. 39,
Disinfection level display

14. Device control programming

7. To save the input value:

   Press the SEt key

   If the setting is not saved, the input is reset to the original value after approx 15 minutes.

8. To return from the disinfection level to the operator level:

   Press the dIS key

A. Installation test / Repeat test

A.1 Classification of the safety cabinet

For application in the EU, the device has been rated as a Class II microbiological safety cabinet in accordance with EN 12469 and DIN 12980.
For application in the USA and in Canada, the device has been laid out as a Class II safety cabinet, Type A/B3, in accordance with NSF Standard 49/2002.
For operation as a device of said classifications, an installation test or repeat test in accordance with NSF Standard 49/2002, Annex F or EN 12469 must be conducted:

- After the final installation before the safety cabinet is operated.
- During the annual inspection.
- After any replacement of the downflow filter.
- After any replacement of the exhaust filter.
- After any repairs to the air distribution system.
- After any relocation of the device to a new location.

When working with safety-critical materials (toxic or slightly radio-active substances), the on-site tests should be conducted at shorter intervals (every three or six months).

A.2 Test terms

Nominal value:
Default value as specified by Kendro Laboratory Products.
Measured value:
Value measured at the location of the safety cabinet.
Tolerance:
Acceptable deviation from the nominal value.
Average value:
The sum of the measuring values divided by the number of tests. The average value is compared to the nominal value.
Set point:
Acceptable operating value for the inflow and downflow velocities.
Inflow velocity (m/s):
Velocity of the air entering the sample chamber opening.
Downflow velocity (m/s):
Velocity of the displacement flow circulating through the work chamber.
Exhaust velocity (m/s):
Velocity of the airflow discharged through the exhaust filter opening.
Exhaust airflow volume (m^3/s):
Velocity of the exhaust airflow volume discharged through the exhaust filter.

A. Installation test / Repeat test

A.3 Extent of the tests

The tests cover all essential safety functions of the device as all values measured at the location of the device are compared to the nominal values. If required, device settings must be changed or the safety cabinet must be modified for the compliance with the nominal value tolerances. Possible measures are listed under **Troubleshooting** at the end of each section.

The tests should be conducted in the following sequence:
- Electrical safety test in accordance with applicable national regulations
- HEPA filter leakage test
- Inflow velocity test
- Downflow velocity test
- Exhaust airflow volume test
- Airflow pattern test (optional test)
- Noise level test
- Lighting intensity test
- Vibration test
- UV intensity test
- Monitoring device test
- Front window functional test

NOTE - Test report

All tests require a test report in duplicate. The operator must receive one copy of the report.

A sample test report is attached at the end of this section.

A.4 Testing equipment

For the conduction of the tests, Kendro Laboratory Products recommend testing equipment of the manufacturers listed below.

A. 4.1 Manufacturers in USA

Testing equipment	Manufacturer/Distributor	Application
Smoke tubes	MSA Pittsburgh, Pennsylvania, 15230	Airflow pattern test
Anemometer	TSI Shoreview, Minnesota 55126	Inflow velocity test
Digital Safety Inspector	Ohmic Instruments Co. Easton, Maryland 21601	Electrical leakage and ground resistance test
GFI Circuit Tester	Leviton Manufactoring Little Neck, New York, 11362	Electrical leakage, ground resistance, and polarity test

A. Installation test / Repeat test

Testing equipment	Manufacturer/Distributor	Application
Photometer	Air Techniques ATI Owing Mills, Maryland, 21117	Filter leak test
Aerosol Generator	Air Techniques ATI Owing Mills, Maryland, 21117	Generation of aerosol mist
Vibration Meter	Quest Technologies Oconomowoc, Wisconsin, 53066	Vibration test
Flow-Hood Airdata Multimeter	Shortridge Instruments. Inc. Scottsdale, Arizona, 85260	Inflow air volume test

A.4.2 Manufacturers in Europe

Testing equipment	Manufacturer/Distributor	Application
Smoke tubes	Dräger GmbH Lübeck, Deutschland	Airflow pattern test
Thermoanemometer	TSI / Technetics Freiburg, Deutschland	Downflow velocity test
Anemometer	TSI / Technetics Freiburg, Deutschland	Inflow velocity test
Multimeter	Gossen-Metrawatt Nürnberg, Deutschland	Electrical leakage and ground resistance test
Laser particle counter	MT Messtechnik GmbH Adelzhausen, Deutschland	Filter leak test
Aerosol Generator	Leschke Messtechnik GmbH Frankfurt(Oder), Deutschland	Generation of aerosol mist
Dilution range	Leschke Messtechnik GmbH Frankfurt(Oder), Deutschland	Dilution of aerosol mist
UV meter	UV-Elektronik GmbH Ettlingen, Deutschland	UV intensity test
Luxmeter	LMT Lichtmesstechnik GmbH Berlin, Deutschland	Lighting intensity test
Vibration meter	Airflow Lufttechnik GmbH Rheinhausen, Deutschland	Vibration test
Heating device	Foramaflow Ltd Windlesham, England	Disinfection with gas, vaporization of formalin and ammonia solution

A. Installation test / Repeat test

A.5 Electrical safety test

Purpose of the test:
This test is conducted to check the electrical safety after the cabinet has been installed and during the annual safety inspection. The following is tested:

▶ Application in USA/Canada (NSF 49):
- PE conductor resistance
- Leakage current test
- Polarity test

▶ Application in EU (EN 12469):
- PE conductor resistance
- Leakage current test

Test conditions
The test is conducted in accordance with the following guidelines:

▶ Application in USA/Canada: UL 3101-1,
▶ Application in EU: IEC 1010-1 / EN 61010-1,
▶ All other applications in accordance with applicable national regulations.

Testing equipment

▶ Application in USA/Canada (NSF 49):
- Electrical safety analyzer (ESA) with 1 kW input impedance and two leads.
  - one lead with a sharp point,
  - one lead with a probe,
  - circuit tester.

▶ Application in EU (EN 12469):
- Testing equipment in accordance with IEC 1010-1 or EN 61010-1 or in accordance with applicable national regulations.

Accessories
Adapter with 3-hole electrical receptacle on one end and 2-prong plug on the other end.

Calibration of the testing equipment
Calibration performed by manufacturer.

A. Testing for electrical leakage

1. Switch all electrical switches of the safety cabinet to position **OFF**.
2. Plug the ESA power plug into the outlet of the power supply.
3. Connect the safety cabinet power plug to the ESA leak current adapter.
4. Turn the ESA function selector to the microamp (mA) scale. Read and record the displayed value.
5. Switch the safety cabinet on, then read and record the displayed measured value.

A. Installation test / Repeat test

B. Testing for ground circuit resistance

1. Switch all electrical switches of the safety cabinet to position **OFF**.
2. Plug the ESA power plug into the outlet of the power supply.
3. Connect the safety cabinet power plug to the ESA ground circuit resistance adapter.
4. Read and record the displayed value.

C. Testing for polarity and ground faults

1. Disconnect all accessories from the device-internal power supply.
2. Set the GFI tester to **polarity** and test each cabinet power outlet. If the polarity is correct, the two yellow lights will light equally. Any other combination of lights indicates a fault as identified on the tester.
4. On devices with ground fault interrupters, disconnect all accessories from the device-internal power supply. Plug the tester into the last connected receptacle in the GFI protected branch.
5. Turn the tester selector switch to the 1, 2, and 3 mA positions. If leakage is detected, the lights will go off indicating leakage in the safety cabinet.

Acceptable values for all applications (in accordance with EN 61010)

The measured electrical leakage must not exceed 3.5 mA, and the cabinet ground circuit resistance must not exceed 0.1 Ω.

Troubleshooting

- **Leakage detected:** Check the cables and terminal clamps of the device-internal power supply and of the safety cabinet.
- **Ground resistance not correct:** Check the power supply lines at the location of the device.
- **Ground faults detected:** Check the device grounding and the power supply lines at the location of the safety cabinet.

A. Installation test / Repeat test

A.6 HEPA filter leakage test

Purpose of the test
This test is conducted to check the HEPA downflow and exhaust filters, the filter housings, and the mounting frames for possible leakage.

Testing equipment
Aerosol photometer with linear or extended logarithmic scale.

Calibration of the testing equipment
Calibration in accordance with the manufacturer's instructions or in accordance with the requirements of IES-RP-CC-013-86T (Institute of Environmental Sciences, Mt. Prospect, Illinois).

Measuring accuracy of the testing equipment

▶ Application in USA/Canada (NSF 49):

- The measuring accuracy must ensure that an aerosol concentration of 10 µg/L DEHS or PAO detects exactly 100 % of the inflowing particles. The resulting light-scattering intensity is used for a comparison measurement. The adjustment of the device must ensure that the value 100 can be read on the 100 % scale.
- The photometer must have a minimum air sample capacity of 0.025 m^3/s (0.081 cfm). The sample image must not exceed 2.5 cm (1 in).

▶ Application in EU (EN 12469):

- Particle counter for individual particles with a dilution range capable of detecting a penetration of 0.01 % or less of particles exceeding 0.3 µm

or

- aerosol photometer with an upper measuring threshold of 10 µg/l-100 µg/l at a measurement range of no fewer than 5 logarithmic concentration levels.

Accessories
Aerosol generator / Dilution range.

Test conditions
The sample chamber of the safety cabinet must be completely empty, windows and doors of the operating room must be closed (no draft).

A. Installation test / Repeat test

1. **Fig. A1:** Route the hose [5] of the aerosol generator [6] so that the aerosols are supplied to the downflow upward airflow.
3. Connect the **Supply** test hose [2] of the downflow unit to the connecting hose [3] of the testing equipment [4].
4. Switch the aerosol generator on.
5. Using the testing equipment [4] with a dilution range of 1:100 or 1:1000, measure the aerosol concentration and check to see if the light-scattering intensity corresponds with the comparison measurement:
   - 10 µg/L DEHS or PAO / NSF 49, Annex F
   - within a range of 10 µg/l - 100 µg/l / EN 12469
6. Scan the discharge side of the downflow filter at a distance of 2.5 cm (1 in) to the filter surface in slightly overlapping measuring strokes. The scan speed should not exceed 5 cm/s (2 in/s).
7. Connect the **Exhaust** test hose [7] of the exhaust unit to the connecting hose [3] of the testing equipment [4].
8. Scan the outside-oriented discharge surface of the exhaust filter above the exhaust aperture [1] at a distance of 2.5 cm (1 in) to the filter surface in slightly overlapping measuring strokes. The scan speed should not exceed 5 cm/s (2 in/s).

Acceptable values

▶ Application in USA/Canada (NSF 49),
▶ Application in EU (EN 12469):
- The escaping volume of aerosols must not exceed 0.001 %.
- When using measuring devices from Air Techniques ATI, the displayed value must not exceed 0.01 %.

Troubleshooting

- Replace downflow filter.
- Replace exhaust filter.

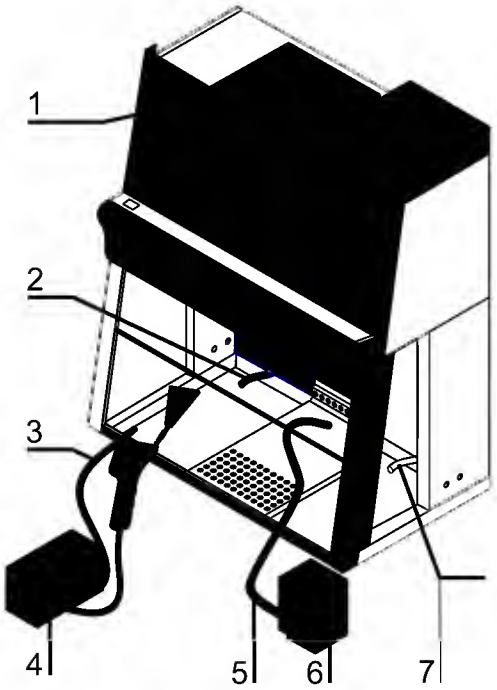


Fig. A1,
HEPA filter leakage test

A. Installation test / Repeat test

A.7 Inflow velocity test

Purpose of the test
This test is conducted to determine the nominal value of the inflow velocity.

Value to be determined
Inflow velocity V_1.

Test methods
▶ Application in USA/Canada (NSF 49):
- The inflow velocity (V_1) is measured directly at the work aperture.
- The inflow air volume (V_2) is measured at a flow hood in the work aperture (Shortridge method).

▶ Application in EU (EN 12469):
- The inflow velocity (V_1) is calculated using the values of the exhaust airflow volume and of the sample chamber inflow surface.
- If the safety cabinet is connected to a technical ventilation, the inflow velocity can also be measured directly at the work aperture.

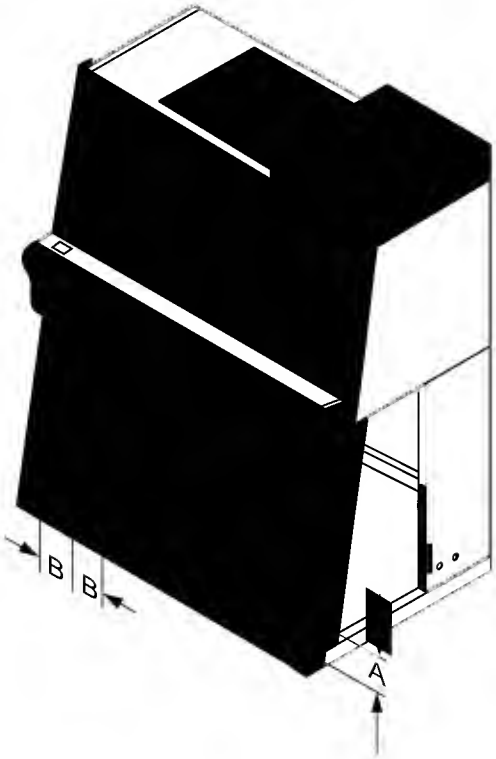
Test conditions
For all test methods, the sample chamber of the safety cabinet must be completely empty, windows and doors of the operating room must be closed (no draft)).

A.7.1 Alternate measurement of the inflow velocity in the work aperture (NSF 49)

Fig. A2: The inflow velocity is measured at several measuring points in the work aperture. For this purpose, the front window is moved up to height **A** = 7.6 cm (3 in). The anemometer is installed directly to the inside of the work aperture front window. The measuring points are located at distance **C** of 3.8 cm (1.5 in) immediately at the inside of the front window lower edge and at distance **B** of 10 cm (4 in) to each other. The lateral distance to the work aperture edges is also 10 cm (4 in).

Testing equipment
Anemometer

Calibration of the testing equipment
The anemometer must be calibrated in accordance with the manufacturer's instructions or in wind tunnel tests.



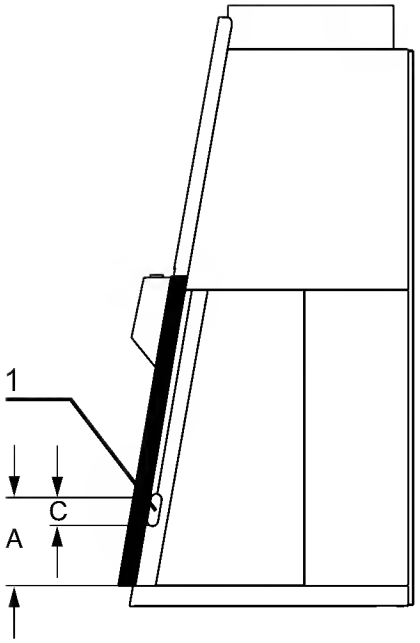


Fig. A2,
Inflow velocity test arrangement

A. Installation test / Repeat test

Accuracy of the testing equipment
Accuracy of ± 0.01 m/s (± 2 ft/min) or a maximal deviation of 3 % from the indicated airflow velocity.

Test measurement
1. Install the testing equipment.
2. Move the front window to the measurement position and operate the air system blower for approx 20 minutes.
3. Perform the measurements.
4. Evaluate the individual measurements.

Calculating the average value for inflow velocity V_1

$$\text{Average} = \frac{\text{Sum of measuring values}}{\text{Number of measuring points}} / 3.33 \times \text{factor}$$

This factor is listed on the device nameplate.

Acceptable values

Acceptable values
▶ Application in USA/Canada (NSF 49, Annex F):
- The nominal value is 0.53 m/s (105 ft/min).
- The average value must be within ± 0.025 m/s (5 ft/min) of the nominal value.

Troubleshooting
- Adjust exhaust blower speed by changing value S02 (see Section 14.3)
- Check exhaust blower control voltage at master board. The control voltage in the value range of 0-10 V changes with the settings in S02. The control voltage of the exhaust blower must be coordinated with the settings in S02.
- Replace exhaust filter.
- Check installed exhaust system for correct function. If installed, change the size of the draft interruptor or check the exhaust plenum (air door) for correct function.

A. Installation test / Repeat test

A.7.2 Alternate measurement of the inflow velocity in the work aperture (EN 12469)

Fig. A2a: The inflow velocity is measured at several measuring points in the work aperture. For this purpose, the front window is moved up to height **A** = 8 cm. The anemometer is installed directly to the inside of the work aperture front window. The measuring points are located at distance **C** of 4 cm immediately at the inside of the front window lower edge and at distance **B** of 10 cm (4 in) to each other. The lateral distance to the work aperture edges is also 10 cm.

Testing equipment
Anemometer

Calibration of the testing equipment
The anemometer must be calibrated in accordance with the manufacturer's instructions or in wind tunnel tests.

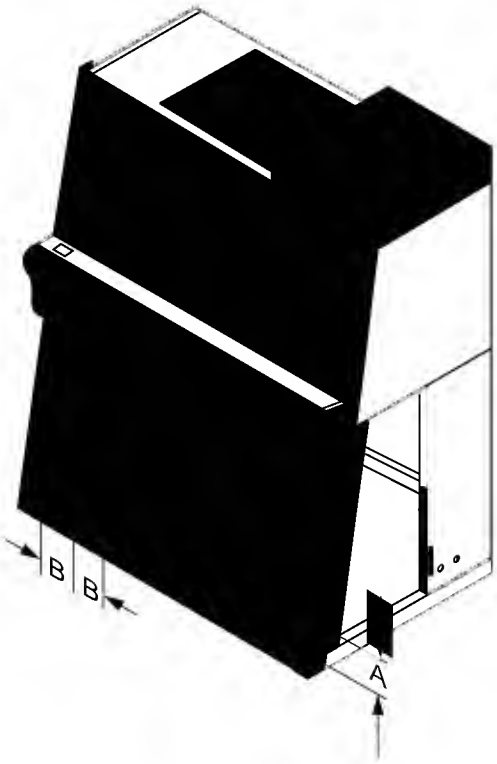
Test measurement
1. Install the testing equipment.
2. Move the front window to the measurement position and operate the air system blower for approx 20 minutes.
3. Perform the measurements.
4. Evaluate the individual measurements.

Calculating the average value for inflow velocity V_1

$$\text{Average} = \frac{\text{Sum of measuring values}}{\text{Number of measuring points}} / 3{,}175$$

Acceptable values
▶ Application in EU (EN 12469):
- The nominal value is 0.45 m/s.
- The average value for the inflow velocity (V_1) must be within ± 10 % of the nominal value.

Troubleshooting
- Adjust exhaust blower speed by changing value S02 (see Section 14.3)
- Check exhaust blower control voltage at master board. The control voltage in the value range of 0-10 V changes with the settings in S02. The control voltage of the exhaust blower must be coordinated with the settings in S02.
- Replace exhaust filter.
- Check installed exhaust system for correct function. If installed, change the size of the draft interruptor or check the exhaust plenum (air door) for correct function.



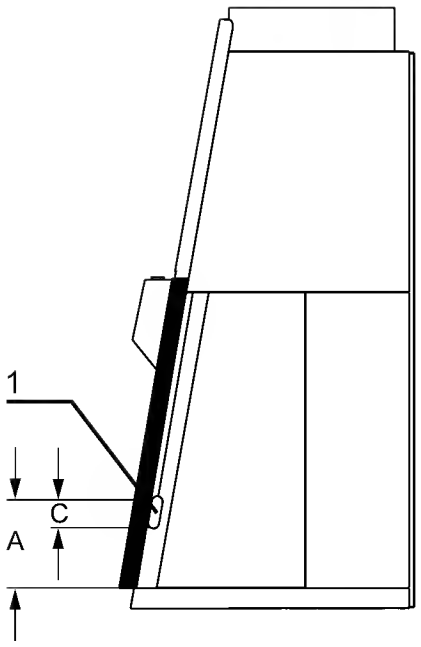


Fig. A2a,
Inflow velocity test arrangement

A. Installation test / Repeat test

A.7.3 Direct measurement (DIM) of the inflow air volume in the work aperture (NSF 49)

Fig. A3: The inflow air volume is measured in the work aperture. The flow hood [1] is installed in the work aperture [2], and the testing equipment is installed immediately at the flow hood discharge opening.

Testing equipment
Airdata Multimeter ADM-870,
Flow hood, Series 8400

Calibration of the testing equipment
The equipment must be calibrated in accordance with the manufacturer's instructions or in wind tunnel tests.

Default value
The default value is the actual device-specific inflow surface A_2 (surface of the work aperture).

KS 9	Actual inflow surface A_2 = 0.23 m²
KS 12	Actual inflow surface A_2 = 0.30 m²
KS 15	Actual inflow surface A_2 = 0.38 m²
KS 18	Actual inflow surface A_2 = 0.46 m²

Test measurement
1. Move the front window to the working position (25.4 cm/ 10 in).
2. Attach the flow hood [1] in the work aperture [2] and seal the remaining opening surfaces.
3. Operate the system blowers for approx 20 min.
4. Perform measurements for a minimum of 1 min.
5. Calculate the inflow velocity (V_1) .

Calculating the inflow velocity V_1

$$\text{inflow velocity } (V_1) = \frac{\text{Inflow air volume } (V_2)}{\text{Actual inflow surface } (A_2)}$$

Acceptable values
▶ Application in USA/Canada (NSF 49, Annex F):
- The nominal value is 0.53 m/s (105 ft/min).
- The inflow velocity must be within ± 0.025 m/s (5 ft/min) of the nominal value.

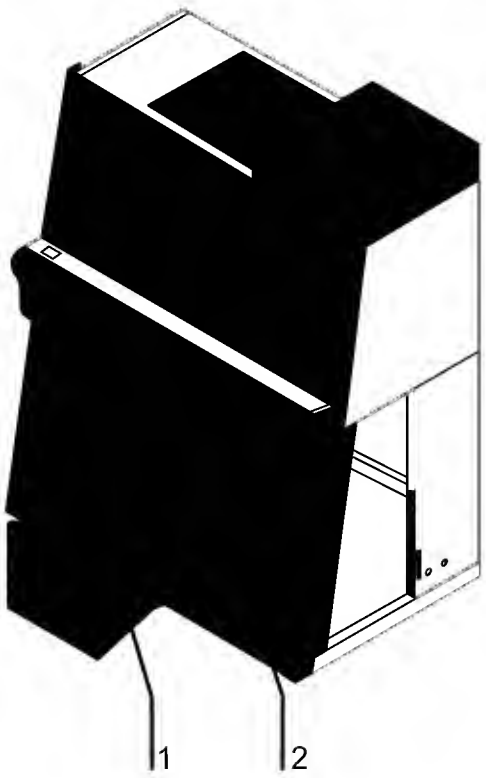


Fig. A3,
Inflow air volume test

A. Installation test / Repeat test

Troubleshooting

- Adjust exhaust blower speed by changing value S02 (see Section 14.3)
- Check exhaust blower control voltage at master board. The control voltage in the value range of 0-10 V changes with the settings in S02. The control voltage of the exhaust blower must be coordinated with the settings in S02.
- Replace downflow filter and/or exhaust filter.
- Check installed exhaust system for correct function. If installed, change the size of the draft interruptor or check the exhaust plenum (air door) for correct function.

A. Installation test / Repeat test

A.7.4 Calculating the inflow velocity (EN 12469)

The average inflow velocity (V_1) is calculated using the average value (V_2) of the directly measured exhaust velocity and the proportion of discharge surface and inflow surface.

Default values

Default values are the discharge surface of the downflow filter A_1 and the actual device-specific air inflow surface A_2 (work aperture surface).

KS 9 Exhaust filter discharge surface A_1 = 0.18 m²
Actual inflow air surface A_2 = 0.230 m²
KS 12 Exhaust filter discharge surface A_1 = 0.246 m²
Actual inflow air surface A_2 = 0.300 m²
KS 15 Exhaust filter discharge surface A_1 = 0.246 m²
Actual inflow air surface A_2 = 0.380 m²
KS 18 Exhaust filter discharge surface A_1 = 0.375 m²
Actual inflow air surface A_2 = 0.450 m²

Values to be measured

Direct exhaust velocity measured at nine measuring points.

Values to be calculated

Average value for exhaust velocity V_2
Exhaust airflow volume R_1
Average value for inflow velocity V_1

Test grid above the exhaust aperture

Fig. A4: The direct exhaust velocity (V_3) is measured using an anemometer at distance **H** of 10 cm above the exhaust aperture. The dimensions of the exhaust aperture are:

KS 9 42.5 x 42.5 cm
KS 12/15 57.8 x 42.5 cm
KS 18 88.3 x 42.5

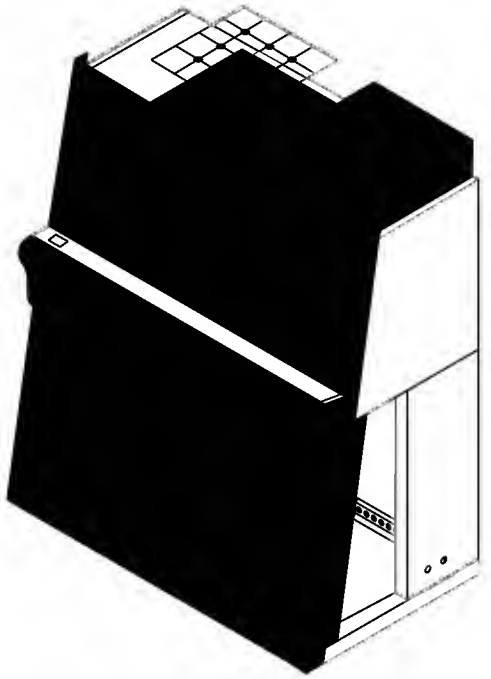
Along the width, the measuring points are located at an even distance of **A** to each other and to the lateral edges of the exhaust aperture.

KS 9 10.5 cm
KS 12/15 14.5 cm
KS 18 22.5

The measuring points along the depth are located at an even distance of **C** = 10.7 cm to each other and to the lateral edges of the exhaust aperture.

Test measurement

1. Install the testing equipment to the test grid.
2. Move the front window to the measuring position and operate the air system blowers for approx 20 minutes.
3. Perform measurement at all nine measuring points above the exhaust aperture for a minimum of one minute for each measuring point.
4. Evaluate the individual measurements.



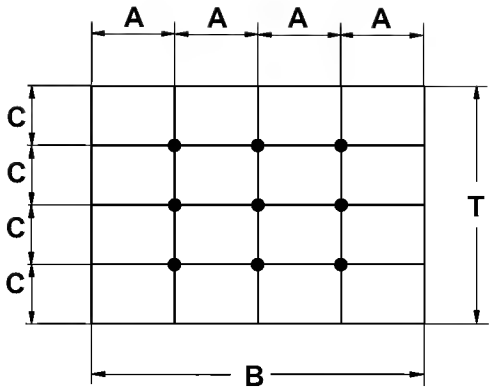


Fig. A4,
Test grid above the exhaust aperture

A. Installation test / Repeat test

Calculating the average value for the exhaust velocity V_2

$$\text{Average value } (V_2) = \frac{\text{Sum of directly measured values}}{\text{Number of measuring points}}$$

Calculating the average value for the inflow velocity V_1 (m/s)
$V_1 \times A_1 = V_2 \times A_2$

Acceptable values
▶ Application in EU (EN 12469):
- The nominal value is 0.45 m/s.
- The average value for the inflow velocity (V_1) must be within ± 10 % of the nominal value.

Troubleshooting
- Raise exhaust blower speed by changing value S02 (see Section 14.3).
- Check exhaust blower control voltage at master board. The control voltage in the value range of 0-10 V changes with the settings in S02. The control voltage of the exhaust blower must be coordinated with the settings in S02.
- Replace exhaust filter.
- Check installed exhaust system for correct function. If installed, change the size of the draft interruptor or check the exhaust plenum (air door) for correct function.

A.7.5 Exhaust airflow volume test

To calculate the exhaust airflow volume (R_1), multiply the average value for the exhaut velocity (V_2)with the actual discharge area of the exhaust filter (A_2).

Calculating the exhaust airflow volumeR_1 (m³/h)
$R_1 = V_2 \times A_2$

Acceptable values
▶ Application in USA/Canada (NSF 49):
- KS 9 250 ft³/h
- KS 12 340 ft³/h
- KS 15 450 ft³/h
- KS 18 500 ft³/h

▶ Application in EU (EN 12469):
- KS 9 370 m³/h
- KS 12 500 m³/h
- KS 15 620 m³/h
- KS 18 740 m³/h

Troubleshooting
- Adjust exhaust blower speed by changing value S02 (see Section 14.3)
- Check exhaust blower control voltage at master board. The control voltage in the value range of 0-10 V changes with the settings in S02. The control voltage of the exhaust blower must be coordinated with the settings in S02.

A. Installation test / Repeat test

- Replace exhaust filter.
- Check installed exhaust system for correct function. If installed, change the size of the draft interruptor or check the exhaust plenum (air door) for correct function.

A.8 Downflow velocity test

Purpose of the test
This test is conducted to check the nominal value of the downflow velocity (displacement airflow) in the work area of the safety cabinet.

Testing equipment
Anemometer

Calibration of the testing equipment
The anemometer must be calibrated in accordance with the manufacturer's instructions or in accordance with the requirements of IES-RP-CC-013-86T (Institute of Environmental Sciences, Mt. Prospect, Illinois).

Accuracy of the testing equipment
Accuracy of ± 0.01 m/s (± 1.98 ft/min) or a maximal deviation of 3 % from the indicated airflow velocity.

Test conditions
The sample chamber of the safety cabinet must be completely empty, windows and doors of the operating room must be closed (no draft).
The thermoanometer measuring head must be secured tightly at the measuring point to allow accurate measurements.
The distances between the measuring points must be correct, the grid must not be distorted.

A.8.1 Test in accordance with NSF 49, Annex F

Fig. A5: The test area above the work surface consists of a rectangular grid that encloses a minimum of 3 measuring rows (zones Z1 - Z3) with 7 measuring points per row:

A =10 cm (5 in): The front window is moved to the safe working position. The test area is positioned horizontally at distance A above the front window lower edge.
B = 15 cm (6 in): Lateral distance between test area and sample chamber sidewalls.
C = 15 cm (6 in): Distance between test area and front window.
D 15 cm (6 in): Distance between test area and device rear panel.

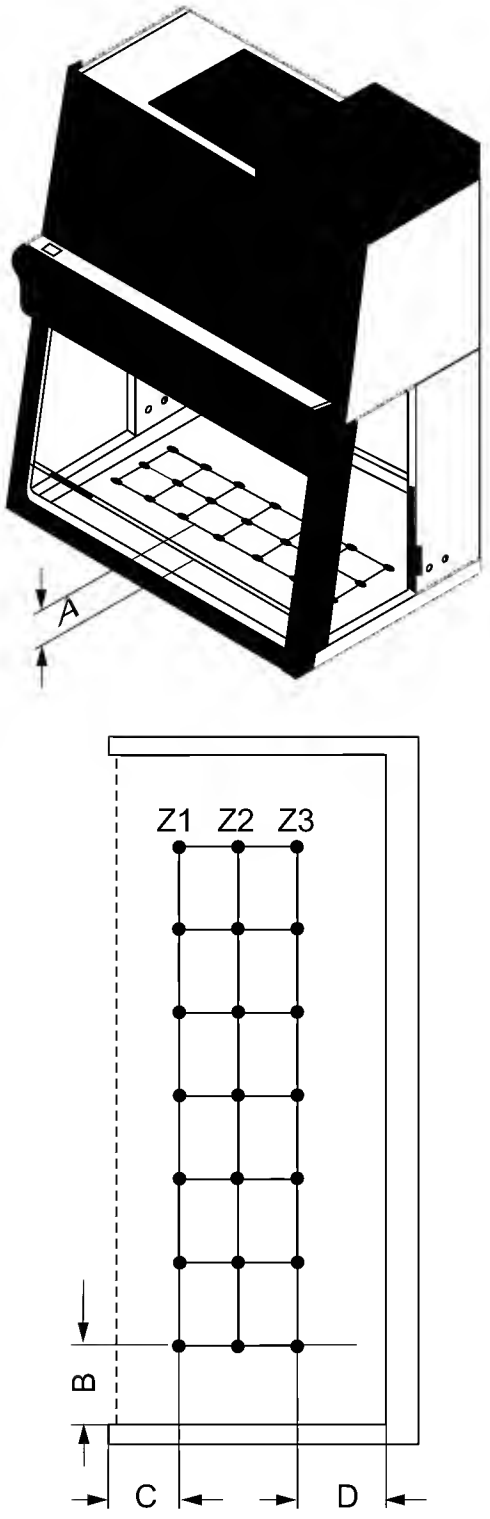


Fig. A5,
Downflow velocity test arrangement in accordance with NSF 49, Annex A

A. Installation test / Repeat test

Test measurement

1. Install the measuring head at the first measuring point.
2. Switch the device on.
3. Move the front window to the working position. The lead time for the first measurement is 20 minutes.
4. Perform the measurement at each measuring point for a minimum of one minute and record the values.
5. Calculate the average value for the downflow velocity.

Calculating the average value for the downflow velocity

$$\text{Average} = \frac{\text{Sum of measured values}}{\text{Number of measuring points}}$$

Acceptable values

▶ Application in USA/Canada (NSF 49):

NOTE – Nominal values

The nominal values for the individual device types are listed on the nameplate.

The unit is examined as a uniform safety cabinet:

The average value must be within ± 0.025 m/s (5 ft/min) of the nominal value. The measured values of **each individual measuring point** must not vary more than 25 % or 16 ft/min (0.081 m/s) from the average downflow velocity.

The unit is examined as a non-uniform (zoned) safety cabinet:

The average value must be within ± 0.025 m/s (5 ft/min) of the nominal value. The measured values of the **individual measuring rows (zones)** must not vary more than 25 % or 16 ft/min (0.081 m/s) from the average downflow velocity of each zone.

Troubleshooting

- Adjust downflow blower speed by changing value S01 (see Section 14.3)
- Check downflow blower control voltage at master board. The control voltage in the value range of 0-10 V changes with the settings in S01. The control voltage of the exhaust blower must be coordinated with the settings in S01.
- Replace downflow filter.

A. Installation test / Repeat test

A.8.2 Test in accordance with EN 12469

Fig. A6: The device is operated with a uniform displacement airflow. Therefore, the measured values at the individual measuring points must be within 20 % of the average value. The test area above the work surface consists of a rectangular grid that encloses a minimum of 2 measuring rows with 4 measuring points per row:

A = 10 cm: The front window is moved to the safe working position. The test area is positioned horizontally at distance **A** above the front window lower edge.

L = Sample chamber width (model-specific):

KS 9 = 90 cm
KS 12 = 120 cm
KS 15 = 150 cm
KS 18 = 180 cm

The values of distances **B** and **C** are calculated from the individual sample chamber width.

B = 1/8 x **L**: Distance between test area and sample chamber sidewalls.

C = 2/8 x **L**: Distance between test area and front window

D = 15.75 cm: Distance between test area and work aperture / device rear panel.

E = 31.50 cm: Distance between grid rows.

Test measurement:

1. Install the measuring head at the first measuring point.
2. Switch the device on.
3. Move the front window to the working position. The lead time for the first measurement ist 20 min.
4. Perform the measurement at each measuring point for a minimum time of one minute and record the values.
5. Calculate the average value for the downflow velocity.

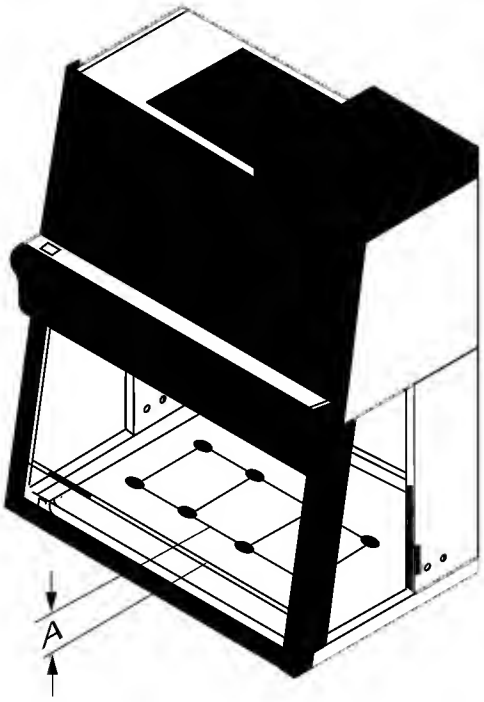
A.8.3 Calculating the average value for the downflow velocity

$$\text{Average} = \frac{\text{Sum of measured values}}{\text{Number of measuring points}}$$

Acceptable values

▶ Application in EU (EN 12469):

- The average value must be within ± 10 % of the nominal value (0.36 m/s).
- The measured values of the individual measuring points must be within 20 % of the average downflow velocity.



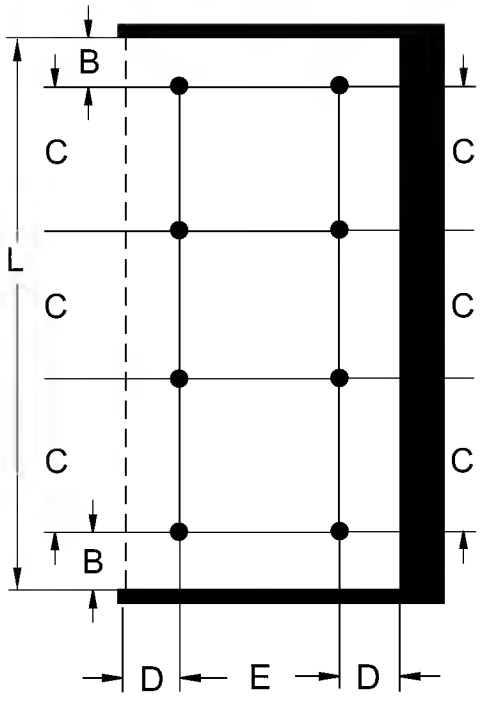


Fig. A6,
Downflow velocity test arrangement in accordance with EN 12469

A. Installation test / Repeat test

Troubleshooting

- Set the downflow blower speed by changing changing value S01 (see Section 14.3). The control voltage in the value range of 0-10 V changes with the settings in S01. The control voltage of the downflow blower must be coordinated with the settings in S01.
- Check downflow blower control voltage at master board. Check exhaust blower control voltage at master board. The control voltage in the value range of 0-10 V changes with the settings in S01. The control voltage of the exhaust blower must be coordinated with the settings in S02.
- Replace downflow filter.

A. Installation test / Repeat test

A.9 Airflow pattern test

Purpose of the test
This test is conducted to check the behavior of the airflows in the sample chamber. Check to see if the displacement airflow passes along the entire work area, if the vertical passage is correct, and if air escapes through joints or seals of the housing and of the front window.

Testing equipment
Smoke tubes.

NOTE – Airflow set points

The individual test sections for airflow patterns can only be performed when the inflow and the downflow velocities are at set point.

A.9.1 Airflow direction test

1. **Fig. A7:** Move the front window to the safe working position **A**.
2. Using a smoke tube, scan the work area along its centerline from one end to the other. Hold the smoke tube so that its tip is at distance **B** of approx 15 cm (6 in) above the work surface.

Acceptable airflow behavior
- ▶ Application in USA/Canada (NSF 49),
- ▶ Application in EU (EN 12469):
- The smoke does not move upwards but is removed downward.
- No smoke escapes through the work aperture.

A.9.2 Leakproofness test for the front window

1. **Fig. A7:** Move the front window to the safe working position **A**.
2. Using a smoke tube, scan the work area at distance **C** of approx 2.5 cm (1 in) to the front window from one end to the other. Hold the smoke tube so that its tip is approx 15 cm (6 in) above the work aperture.

Acceptable airflow behavior
- ▶ Application in USA/Canada (NSF 49),
- ▶ Application in EU (EN 12469):
- The smoke shows smooth downward flow with no dead spots or reflux.
- No smoke escapes through the work aperture.

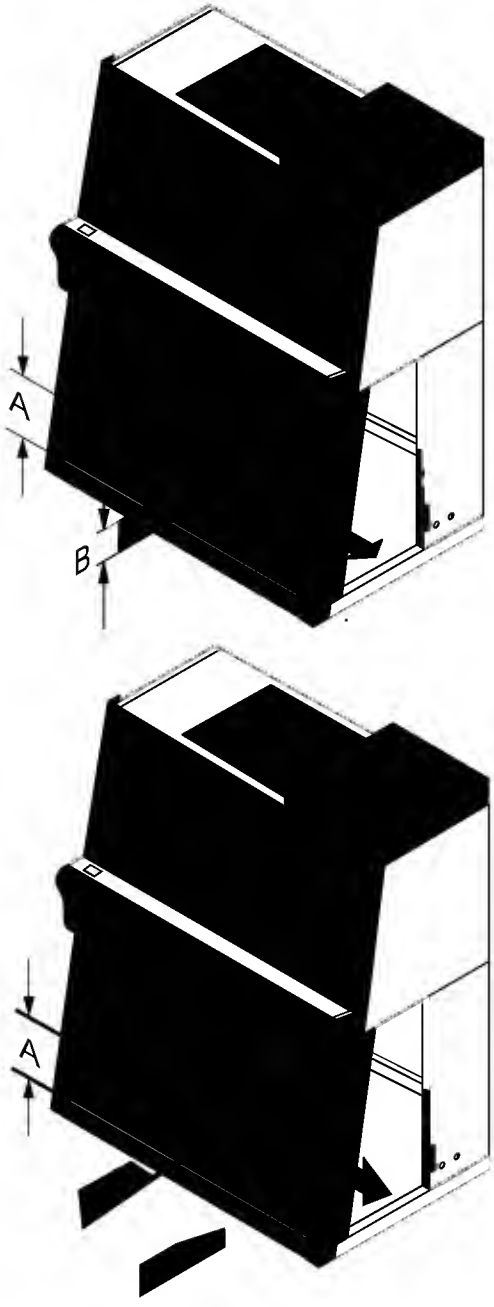


Fig. A7,
Airflow pattern I

A. Installation test / Repeat test

A.9.3 Leakproofness test for edges and corners

1. **Fig. A8:** Move the front window to the safe working position **A**.
2. Outside the front side of the sample chamber, pass a smoke tube from one end to the other along the work aperture at distance **C** of 4 cm (1.5 in) with particular attention paid to the edges and corners of the work aperture.

Acceptable airflow behavior

▶ Application in USA/Canada (NSF 49),
▶ Application in EU (EN 12469):
• There is no smoke formation above the work surface, nor is smoke drawn to the work surface.

A.9.4 Leakproofness test for seals and for the upper closing edge

1. **Fig. A8:** Move the front window to the safe working position **A**.
2. From the inside, pass a smoke tube along the window frame seals and along the upper closing edge of the front window.

Acceptable airflow behavior

▶ Application in USA/Canada (NSF 49),
▶ Application in EU (EN 12469):
• Smoke does not escape from the safety cabinet.
• There is no upward vortexting.

Troubleshooting

• If vortexing or dead points occur, check the inflow and downflow set points.

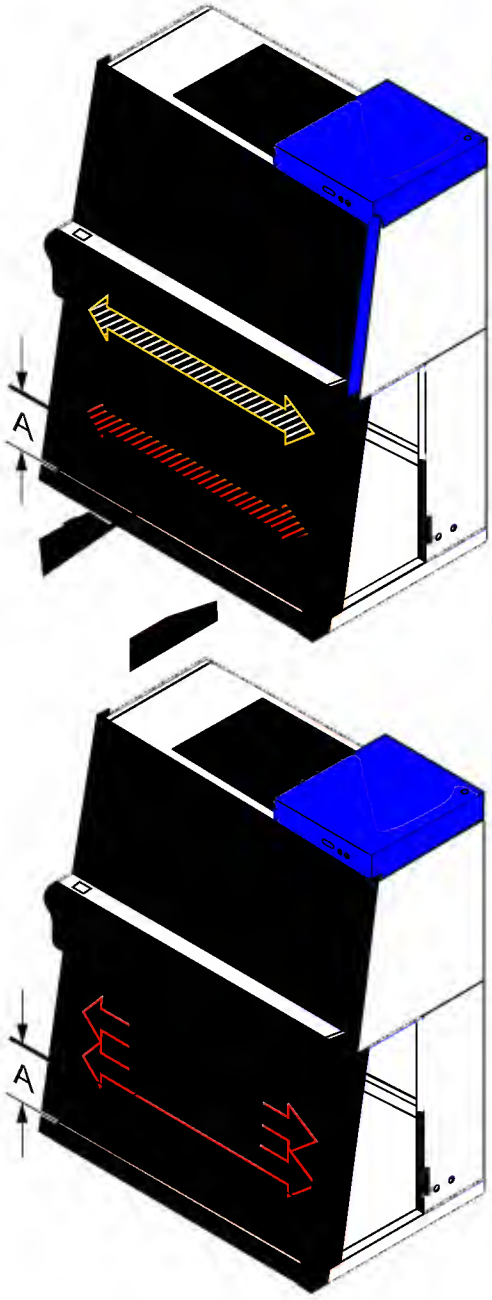


Fig. A8,
Airflow pattern II

A. Installation test / Repeat test

A.10 Noise level test

Purpose of the test (only for application in USA/Canada in accordance with NSF 49)
This test determines the noise level produced by an operating safety cabinet as an aid in minimizing cabinet operator's fatigue. Conduct this test only at the customer's request.

Testing equipment
Noise level meter with a range of 50-100 db and an „A" weighting scale.
Calibrator for the noise level meter.

Calibration of the testing equipment
The testing equipment must be calibrated in accordance with the manufacturer's instructions.

Test point
Fig. A9: Place the microphone outside the safety cabinet at distance **B** of 30 cm (12 in) to the work aperture and at a height **H** of 38 cm (15 in) above the work surface at the center of the work aperture.

Test conditions
Normal conditions at the location of the safety cabinet.

Test measurement
1. With the cabinet switched off, perform the measurement and record the value.
2. Switch on the cabinet and the cabinet lighting, determine the noise level, and record the value.

Acceptable values
▶ Application in USA/Canada (NSF 49):
- The ambient noise level must not exceed 57 dbA. With the cabinet operating, the noise level must not exceed 67 dB(a).

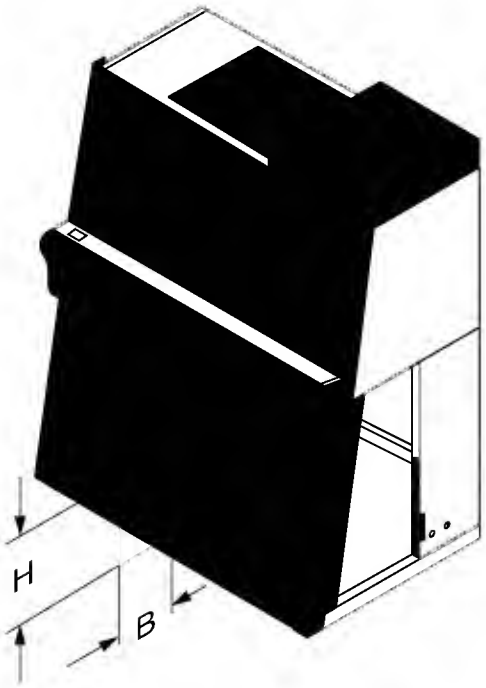


Fig. A9,
Noise level test

A. Installation test / Repeat test

A.11 Lighting intensity test

Purpose of the test (only for application in USA/Canada in accordance with NSF 49)
Checking the illumination in the sample chamber under ergonomic aspects. Conduct this test only at the customer's request.

Testing equipment
Illumination meter in accordance with the requirements of the IES (Illuminating Engineering Society).

Calibration of the testing equipment
The illumination meter must be calibrated by the manufacturer.

Test area at the work surface
Fig. A10: Test line in the center of the work surface parallel to the front window. Beginning with distance **B** of 15 cm (6 in) to the sidewalls, measure the lighting intensity at distance **A** of 30 cm (12 in).

Test conditions
Normal lighting at the location of the safety cabinet.

Test measurement
1. Install the testing equipment.
2. Turn on the lighting of the safety cabinet. The lead time for the measurement is at least 30 minutes.
3. Switch the blower on.
4. Perform the measurements at the test points and record the values.
5. Repeat the measurements with the cabinet lights off.

Calculating the average value

$$\text{Average} = \frac{\text{Sum of measured values}}{\text{Number of measuring points}}$$

Acceptable values
▶ Application in USA/Canada (NSF 49):
- With a background lighting (lighting at the place of location) of 110 lx (± 50 lx), the average lighting intensity at the work surface must exceed 650 lx.
- Individual values must not fall below 430 lx.

Troubleshooting
- Check luminescent tubes and replace tubes, if required.

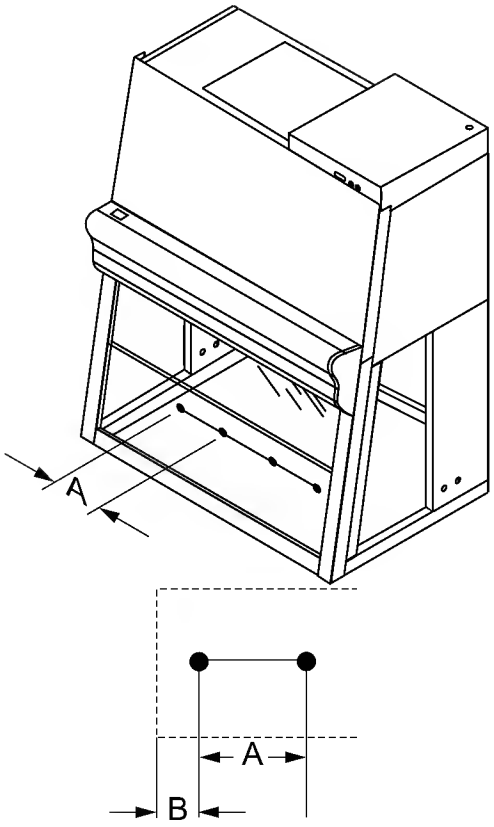


Fig. A10,
Lighting intensity test

A. Installation test / Repeat test

A.12 Vibration test

Purpose of the test (only for application in USA/Canada in accordance with NSF 49).
This test determines the amount of vibration with the blowers on. Conduct this test only at the customer's request.

Testing equipment
Vibration analyzer with a minimum sensitivity of 2.5 µm rms (0.0001 in rms). Calibrator for the vibration analyzer.

Calibration of the testing equipment
The testing equipment must be calibrated in accordance with the manufacturer's instructions.

Test conditions
Normal conditions at the place of location. The rack must be aligned horizontally. Inflow and downflow velocities must be at set point.

Test measurement

☞ **NOTE – Multi-modules workplate:**

If more than 3 workplate modules are installed, two measurements should be performed at the centerline between the two inner modules.

1. **Fig. A11:** Secure the sensor of the vibration analyzer firmly to the center [1] of the workplate using double-faced adhesive tape.
2. Determine the background vibration amplitude with the cabinet switched off and record the value.
3. Switch on the cabinet and the cabinet lighting, determine the vibration value, and record the value.

Determining the vibration value
Vibration value = operating value - background value

Acceptable values
▶ Application in USA/Canada (NSF 49):
- The deviation must not exceed more than 5 x 10^{-6} m or 2x 10^{-4} inch at 10 Hz - 10 kHz.

Troubleshooting
- Check workplate seating.
- Check rack for secure stand.
- In case of excessive values, check radial blower for imbalance.

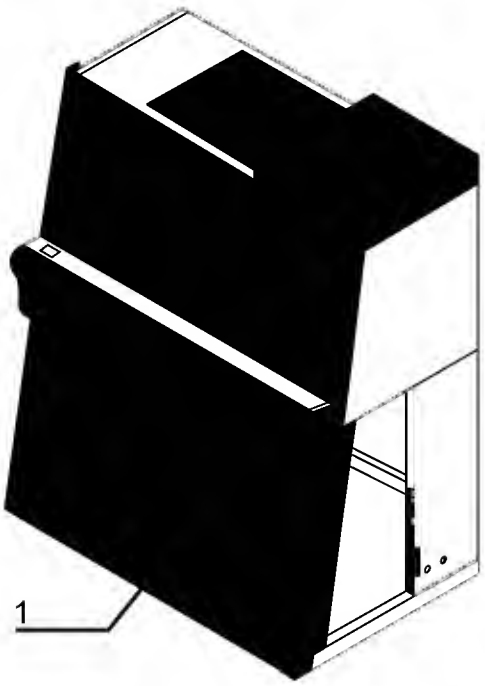


Fig. A11,
Vibration test

A. Installation test / Repeat test

A.13 UV intensity test

Purpose of the test
The power of the UV lamps will be considerably reduced after 1500 operating hours so that an effective UV disinfection is no longer ensured. Conduct this test only at the customer's request.

Test procedure
1. Read the UV operating time value from service level S9 (see Section 12.3.2).
2. If the value is just below or over 1500 h, replace all UV lamps.
3. After the UV lamps have been replaced, reset the UV operating time value at service level S9 to zero.

A.14 Monitoring device setting

The settings are made on the service level using parameters S03 and S05.

Purpose of the setting
Setting of the sensor response characteristics for downflow velocity and inflow velocity. The alarm values are set so that the visual and audible warnings are issued when the corresponding airflow velocity falls below the lower limit or exceeds the upper limit.

Test conditions
The sample chamber of the safety cabinet must be completely empty, windows and doors of the operating room must be closed (no draft).

Reference values
The nominal values of the control voltage for the downflow and exhaust blowers from service levels S01 and S02 of the device control are used as reference values for setting the alarm values. If the values in S01 or S02 are changed, the alarm limits in S03 and S05 must be adapted in accordance with DIN EN 12469.

A.14.1 Downflow velocity alarm values

▶ Application in EU (EN 12469):
- The average airflow velocity must have been determined using an anemometer.

Setting the alarm value:
1. Switch the safety cabinet on. The lead time for the setting is approx 20 min.
2. Calculate the average downflow velocity (see Section A.8).
3. Go to service level S03. In S03, lower the blower overall output so that the value is approx 10 % below the calculated average value.

A. Installation test / Repeat test

4. Save the input value:

   Wait until the display shows SEt.

   Press the SEt key

A.14.2 Inflow velocity alarm values

▶ Application in EU (EN 12469):

- The average airflow velocity must have been determined using an anemometer.

Setting the alarm value:

1. Switch the safety cabinet on. The lead time for the setting is approx 20 min.
2. Calculate the average inflow velocity (see Section A.7).
3. Go to service level S05. In S05, lower the blower overall output so that the value is approx 10 % below the calculated average value.
4. Save the input value:

   Wait until the display shows SEt.

   Press the SEt key

B. Decontamination with gas

B.1 Disinfection with formaldehyde

Prior to any repairs in the contaminated area (blower/filter assembly), the device and the filters must be completely decontaminated. Generally, a gas decontamination using formaldehyde is performed.

CAUTION – Dangerous gases!

A disinfection using formaldehyde must be performed in accordance with the specifications of NSF 49/1992, Annex G or EN 12469.

This procedure presents considerable risks and must therefore be performed only by specially trained and authorized service personne in accordance with applicable national safety regulations (e.g. Germany: TRGS 522)!

B.1.1 Procedure

For gas disinfection, formaldehyde is vaporized within the tightly sealed sample chamber. The quantity of the applied formaldehyde depends on the volume of the sample chamber in the safety cabinet that is to be disinfected (see Technical Data). The formaldehyde evaporates immediately after reaching its boiling point; the minimum reaction time is 6 hours. Therefore, the formaldehyde should be neutralized after the specified reaction time by vaporizing 25 % aqua ammonia (10 ml per cubic meter of sample chamber volume).

CAUTION ! – Fire hazard!

Formalin is flammable. The auto-ignition temperature of formalin is 430° C (820° F).

With a volume percentage of 7.75 % in dry air, formaldehyde vapor may explode.

For vaporization, do not use heating devices reaching temperatures above 250° C (477° F).

CAUTION! – Hazardous chemicals!

Formalin in reaction with hydrogen chloride will form BCME which is a hazardous chemical.

When using formalin, all residues of hydrogen chloride in the work chamber of the cabinet must be removed!

B. Decontamination with gas

B.1.2 Gas disinfection

- **Application in USA/Canada (NSF 49)**
- **Application in EU (EN 12469)**

Ambient conditions
The temperature in the work room should be approximately 21° C (40° F); the relative humidity should be between 60 and 85 %.

Accessories
Appliances:
For vaporizing both solutions, an appropriate heating device with thermostat and two separate containers for formaldehyde solution and for aqua ammonia are required.

NOTE – Warning label

A warning label should be attached to the safety cabinet during the vaporization process.

Formaldehyde solution (20 %)
On the basis of the calculated safety cabinet volume, use a formaldehyde quantity that ensures a permanent formaldehyde concentration in the air. A minimum quantity of 50 ml formaldehyde per cubic meter of safety cabinet volume should be vaporized.
The required formaldehyde quantity depends on the sample chamber volume (5 g/m³ dissolved in 20 ml water).

KS 9	1.1 m³	5.5 g	55 ml
KS 12	1.4 m³	7.0 g	70 ml
KS 15	1.7 m³	8.5 g	85 ml
KS 18	2.1 m³	10.5 g	105 ml

Aqua ammonia (25 %)

KS 9	1.1 m³	11.0 ml
KS 12	1.4 m³	14.0 ml
KS 15	1.7 m³	17.0 ml
KS 18	2.1 m³	21.0 ml

B. Decontamination with gas

Procedure

1. Switch the device OFF.
2. **Fig. B1:** Seal the exhaust aperture [4] absolutely airtight using the disinfection hood [3]: Install the disinfection hood to the premounted threaded holes [1] using the supplied screws [2].
3. Insert the heating device [5] into the sample chamber and connect it to the device-internal power supply.
4. Set the heating device thermostat to 230° C (437° F). Set the timer so that the aqua ammonia container will not be heated sooner than 7 hours after the formaldehyde container.
5. Fill formaldehyde solution and aqua ammonia into the heating device containers.
6. Switch the safety cabinet on and lower the front window completely The device is switched to stand-by mode (reduced blower speed).
7. Switch the device-internal power supply on so that the formaldehyde solution begins to evaporate.
8. When the formaldehyde solution has evaporated, switch the safety cabinet OFF. Allow the formaldehyde to react for approx 7 hours.
9. After a minimum time of 7 hours, neutralization with aqua ammonia should start. After the aqua ammonia has evaporated, switch the safety cabinet back on and switch it to stand-by mode so that the blowers operate for 5-10 minutes.
10. Switch the safety cabinet OFF and allow the aqua ammonia to react for approx 30 minutes.
11. Switch the device to operating mode and remove the disinfection hood.
12. After any disinfection with gas, the front door seal should be replaced.

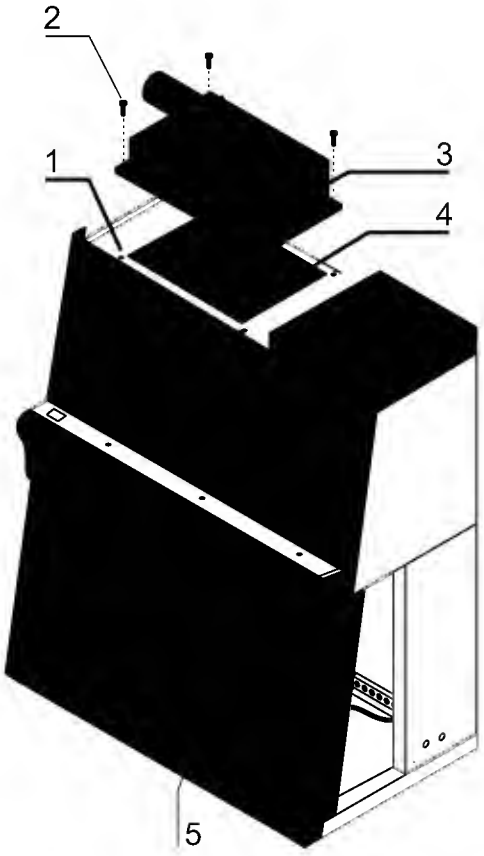


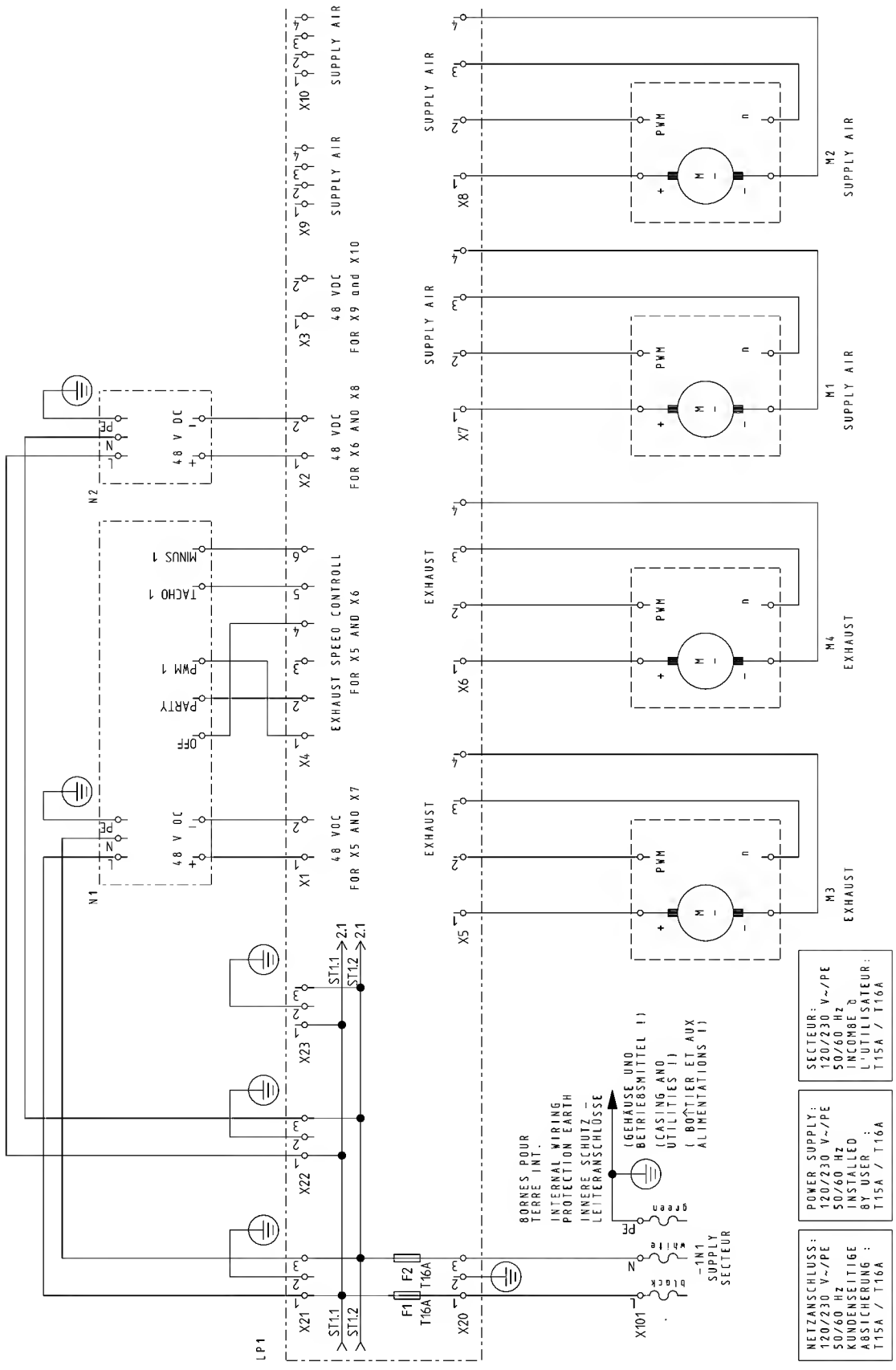
Fig. B1,
Disinfection hood

NOTE – Disinfection hood

The air discharged into the disinfection hood can be routed either into the vapor canister or into an appropriate exhaust system (see Section 3.3).

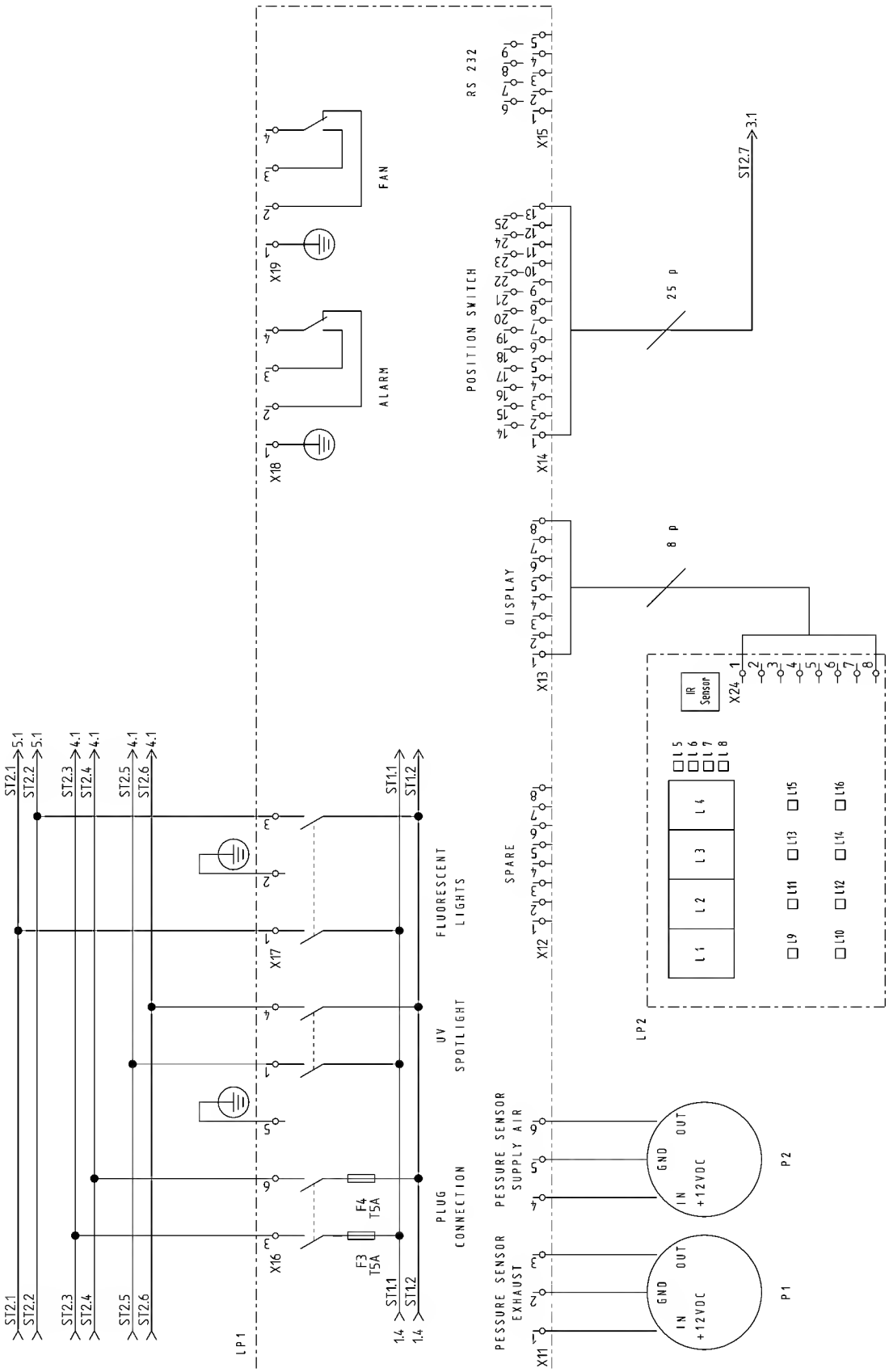
C. Wiring diagrams

50077286_1 HERASafe, KS 100 - 240 VAC



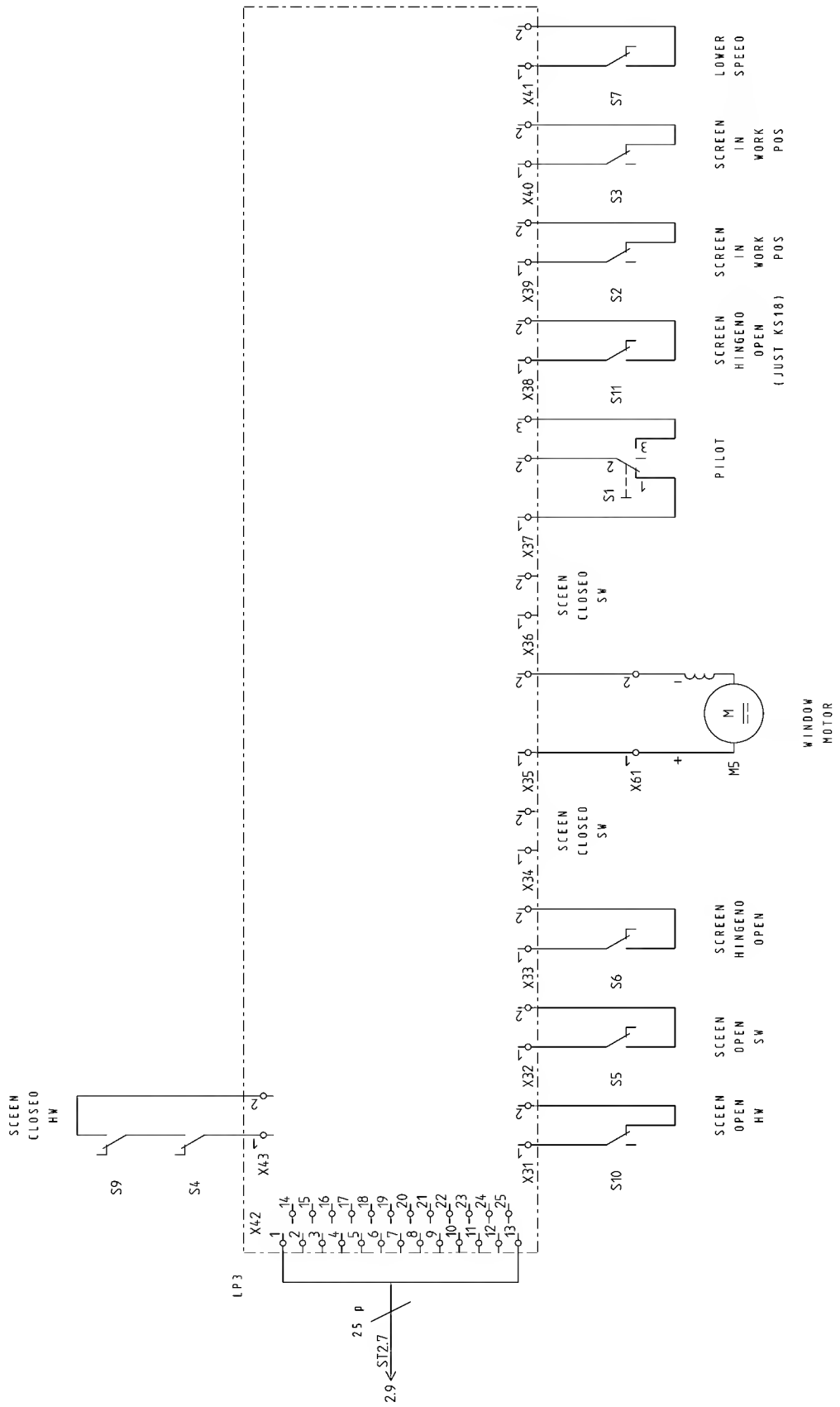
C. Wiring diagrams

50077286_2 HERASafe, KS 100 - 240 VAC



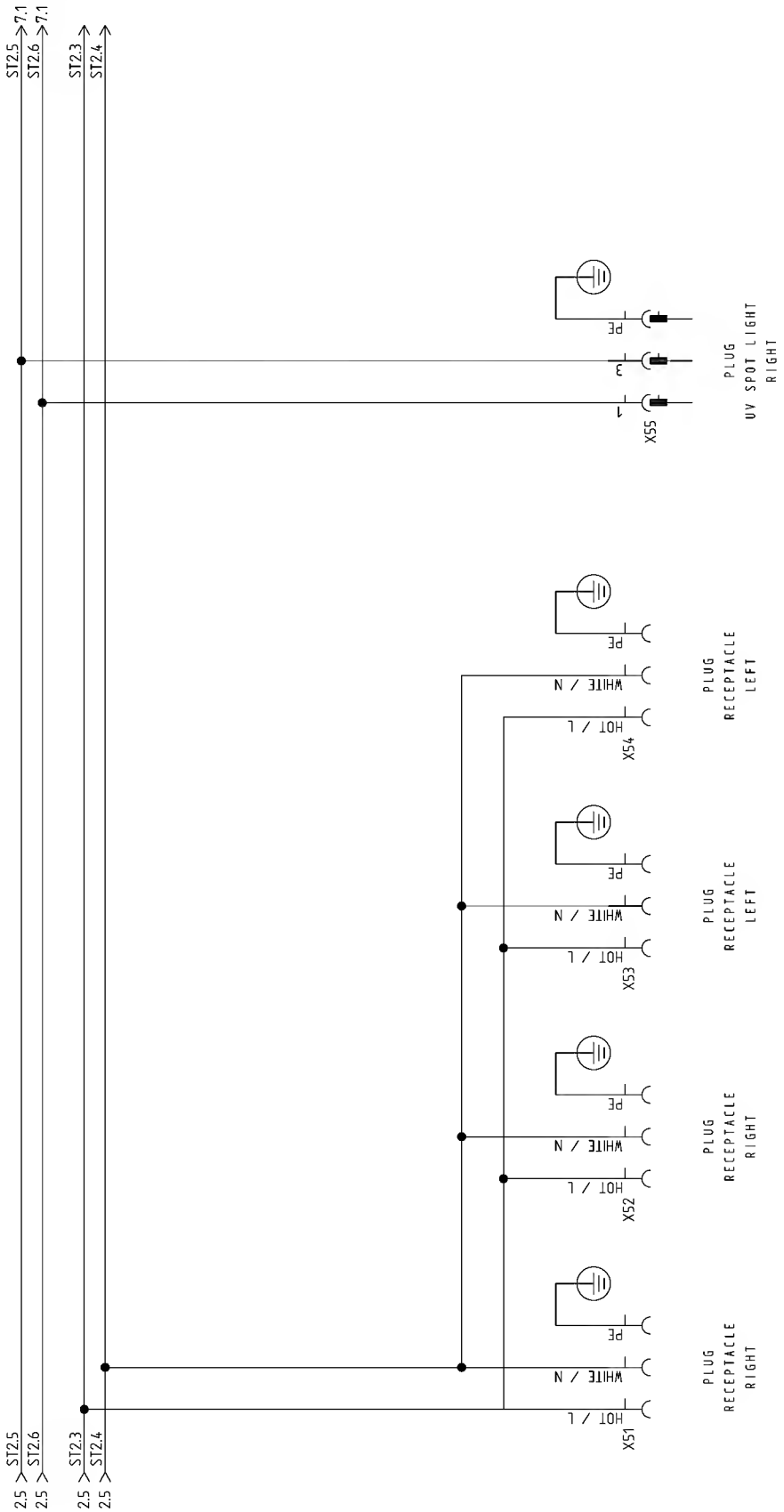
C. Wiring diagrams

50077286_3 HERASafe KS, 100 - 240 VAC



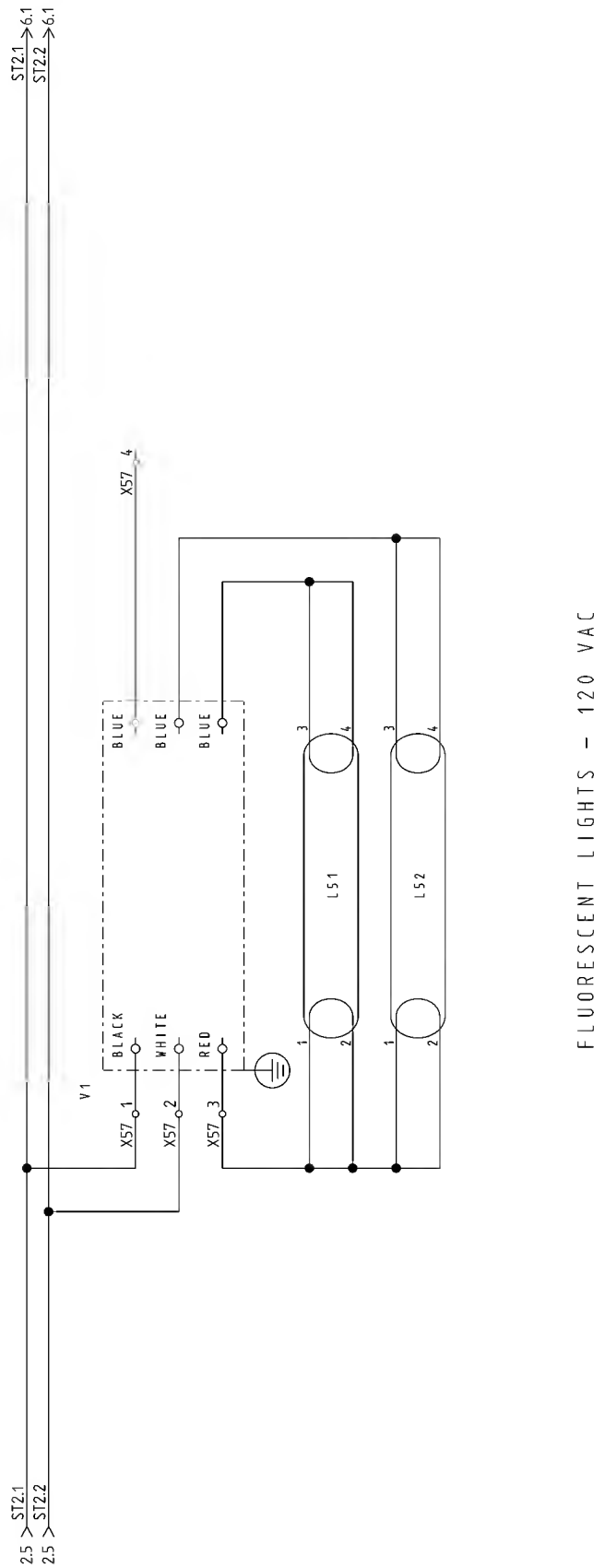
C. Wiring diagrams

50077286_4 HERASafe KS, 100 - 240 VAC



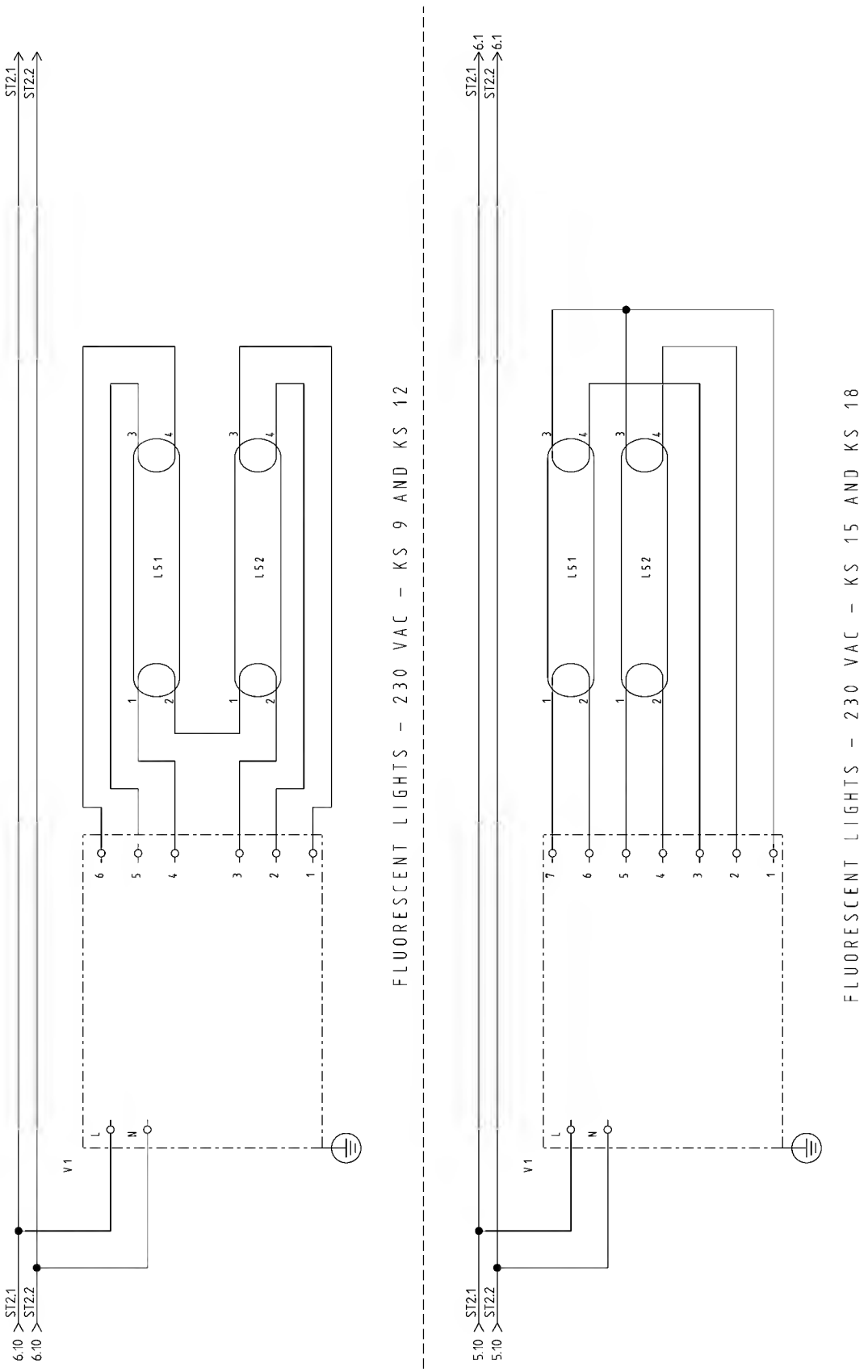
C. Wiring diagrams

50077286_5 HERASafe KS, 100 - 240 VAC



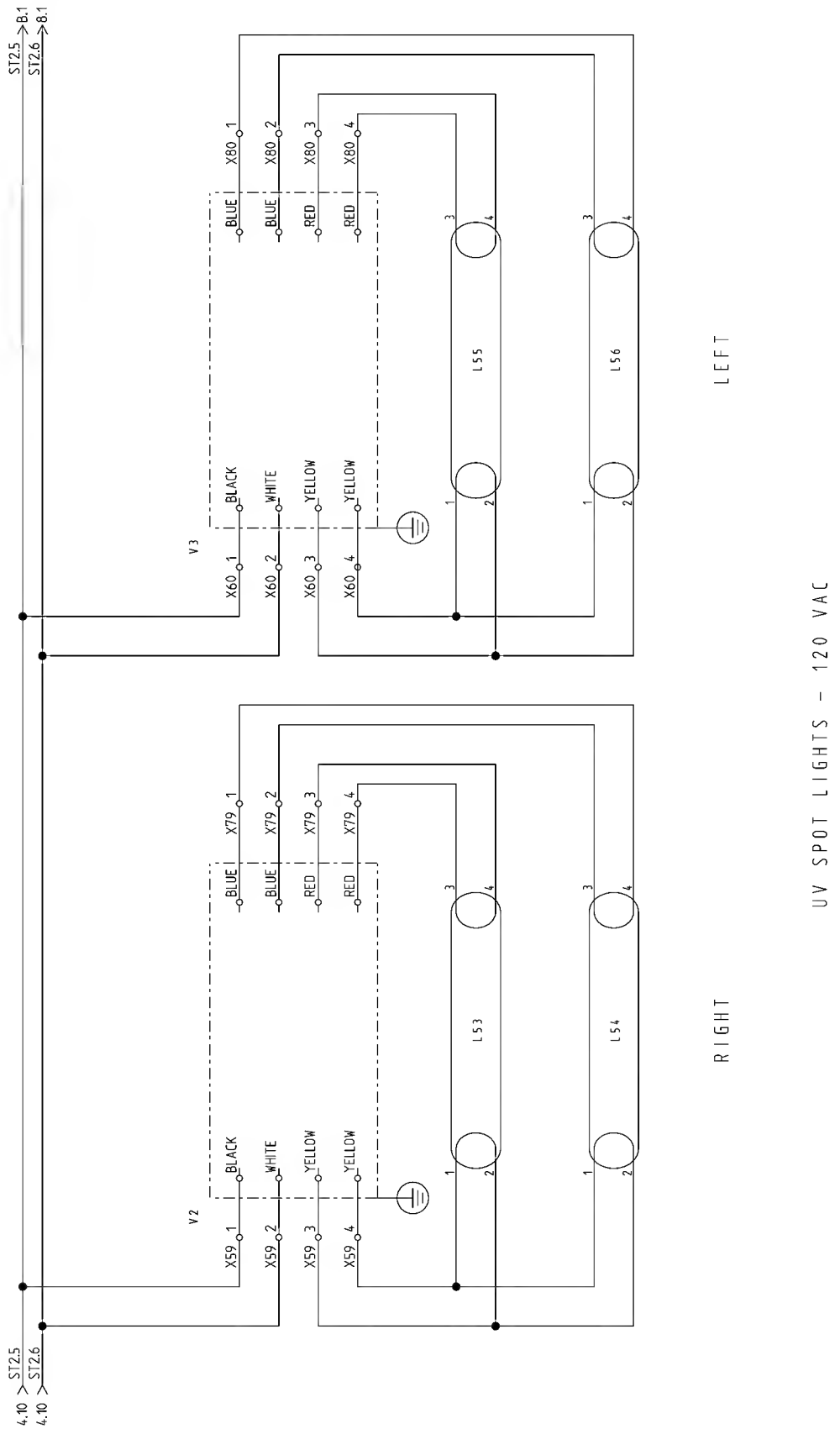
C. Wiring diagrams

50077286_6 HERASafe KS, 100 - 240 VAC



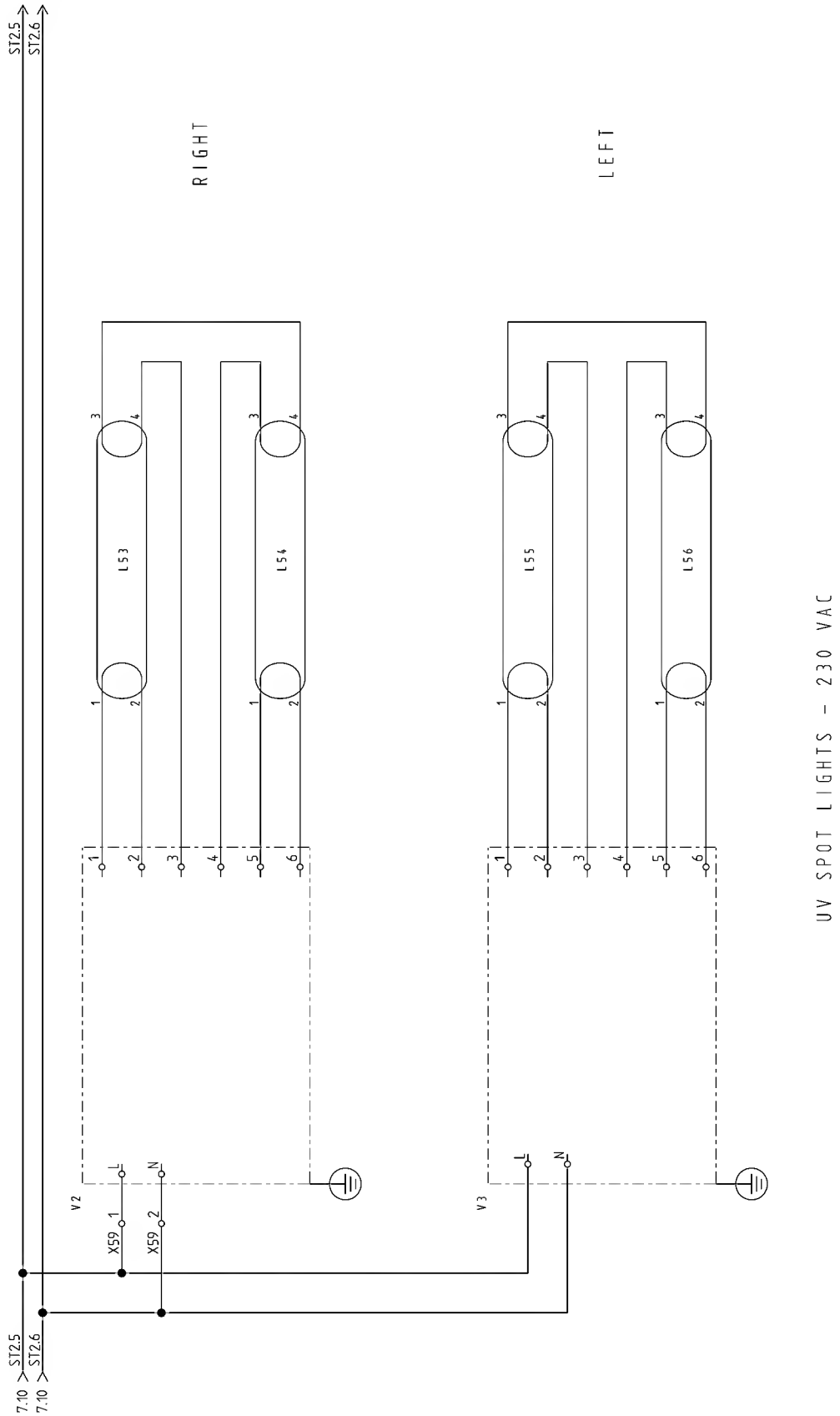
C. Wiring diagrams

50077286_7 HERASafe KS, 100 - 240 VAC



C. Wiring diagrams

50077286_8 HERASafe KS, 100 - 240 VAC



C. Wiring diagrams

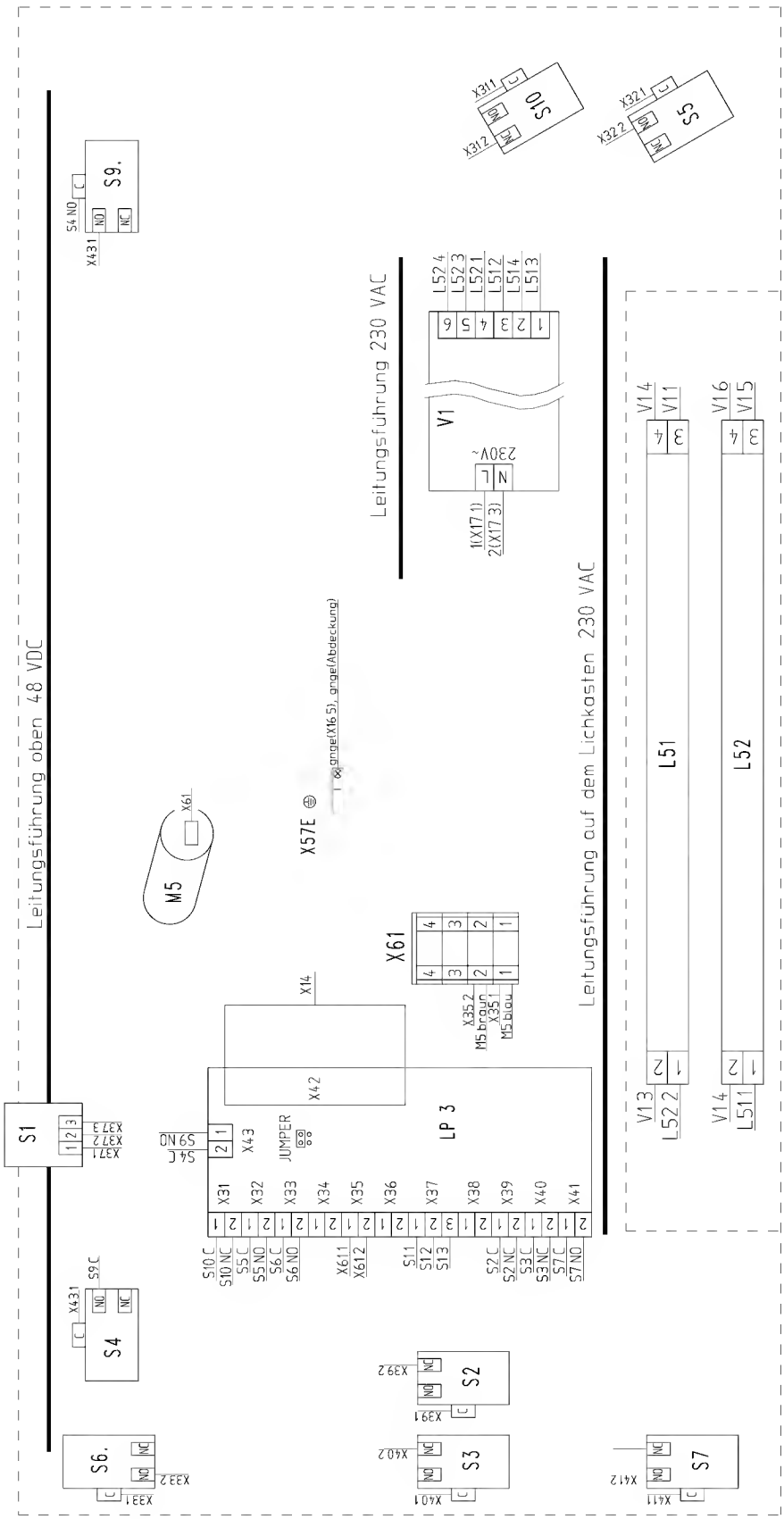
50077286_9 HERASafe KS, 100 - 240 VAC

LEGENDE ZU: SP HERAsafe KS, 100 - 240 VAC	
NAME	BETRIEBSMITTEL
F1-2	SICHERUNGEN; NETZ
F3-4	SICHERUNGEN; EXPERIMENTIERRAUM STECKDOSEN, X51-X54
L1-4	7 SEGMENTE ANZEIGE AUF LP2
L5-16	LED AUF LP2
L51-52	LEUCHTSTOFFLAMPEN; EXPERIMENTIERRAUM
L53-56	UV STRAHLER (OPTION)
LP1	GRUND LEITERPLATTE
LP2	ANZEIGE LEITERPLATTE
LP3	SCHALTER LEITERPLATTE
M1	MOTOR, UMLUFT
M2	MOTOR, UMLUFT (NUR KS 15 UND KS 18)
M3	MOTOR, ABLUFT
M4	MOTOR, ABLUFT (NUR KS 15 UND KS 18)
M5	MOTOR, FRONTSCHEIBE
N1	SCHALTNETZTEIL; M1, M3 UND GERÄT
N2	SCHALTNETZTEIL, M2 UND M4 (NUR KS 15 UND 18)
P1	DRUCK SENSOR; UMLUFT
P2	DRUCK SENSOR; ABLUFT
S1	SCHALTER "PILOT SWITCH"
S2,S3	POSITIONSSCHALTER, FRONTSCHEIBE IN ARBEITSPOSITION
S4,S9	POSITIONSSCHALTER, FRONTSCHEIBE ZU
S5	POSITIONSSCHALTER, FRONTSCHEIBE OFEN
S6	POSITIONSSCHALTER, FRONTSCHEIBE GEKLAPPT
S7,S8	POSITIONSSCHALTER, REDUZIERTE DREHZAHL
S11	POSITIONSSCHALTER, FRONTSCHEIBE GEKLAPPT (NUR KS 15 UND 18)
V1	ELEKTRONISCHES VORSCHALTGERÄT; L51-52
V2,V3	ELEKTRONISCHE VORSCHALTGERÄTE; L53-56 (OPTION)
X1-23	STECKVERBINDER AUF LP1
X24	STECKVERBINDER AUF LP2
X31-X41	ANSCHLUSS AUF LP3
X42	STECKVERBINDER AUF LP3
X43	ANSCHLUSS AUF LP3
X51-54	STECKDOSEN; EXPERIMENTIERRAUM
X55	STECKDOSE UV, RECHTS (OPTION)
X57,X58	KLEMMENLEISTE; LEUCHTSTOFFLAMPEN EXPERIMENTIERRAUM
X59,X79	KLEMMENLEISTE UV STRAHLER, RECHTS (OPTION)
X60,X80	KLEMMENLEISTE UV STRAHLER, LINKS (OPTION)
X101	KLEMMENLEISTE; NETZANSCHLUSS

LEGEND TO: SP HERAsafe KS, 100 - 240 VAC	
NAME	ACCESORIES
F1-2	FUSE; MAIN
F3-4	FUSE; PLUG RECEPTACLES EXPERIMENT ROOM, X51-X54
L1-4	7 SEGMENTE DISPLAY ON LP2
L5-16	LED ON LP2
L51-52	FLUORESCENT LIGHTS; EXPERIMENT ROOM
L53-56	UV SPOTLIGHT (OPTION)
LP1	MAIN BOARD
LP2	DISPLAY BOARD
LP3	SWITCH BOARD
M1	MOTOR, SUPPLY AIR
M2	MOTOR, SUPPLY AIR (ONLY KS 15 AND KS 18)
M3	MOTOR, EXHAUST
M4	MOTOR, EXHAUST (ONLY KS 15 AND KS 18)
M5	MOTOR, WINDOW
N1	SWITCHING POWER SUPPLY; M1, M3 AND INSTRUMENT
N2	SWITCHING POWER SUPPLY, M2 AND M4 (ONLY KS 15 AND 18)
P1	PRESSURE SENSOR; SUPPLY AIR
P2	PRESSURE SENSOR; EXHAUST
S1	PILOT SWITCH
S2,S3	POSITION SWITCH, SCREEN IN WORK POSITION
S4,S9	POSITION SWITCH, SCREEN CLOSE
S5	POSITION SWITCH, SCREEN OPEN
S6	POSITION SWITCH, SCREEN HINGED OPEN
S7,S8	POSITION SWITCH, LOWER SPEED
S11	POSITION SWITCH, SCREEN HINGED OPEN (ONLY KS 15 AND 18)
V1	ELECTRONIC BALLAST; L51-52
V2,V3	ELECTRONIC BALLAST; L53-56 (OPTION)
X1-23	PLUG CONNECTION ON LP1
X24	PLUG CONNECTION ON LP2
X31-X41	CONNECTION ON LP3
X42	PLUG CONNECTION ON LP3
X43	CONNECTION ON LP3
X51-54	PLUG RECEPTACLES; EXPERIMENT ROOM
X55	PLUG CONNECTION UV, RIGHT (OPTION)
X57,X58	PLUG CONNECTION; FLUORESCENT LIGHTS; EXP.ROOM
X59,X79	PLUG CONNECTION; UV SPOTLIGHT, RIGHT (OPTION)
X60,X80	PLUG CONNECTION; UV SPOTLIGHT, LEFT (OPTION)
X101	PLUG CONNECTION; MAINS

C. Wiring diagrams

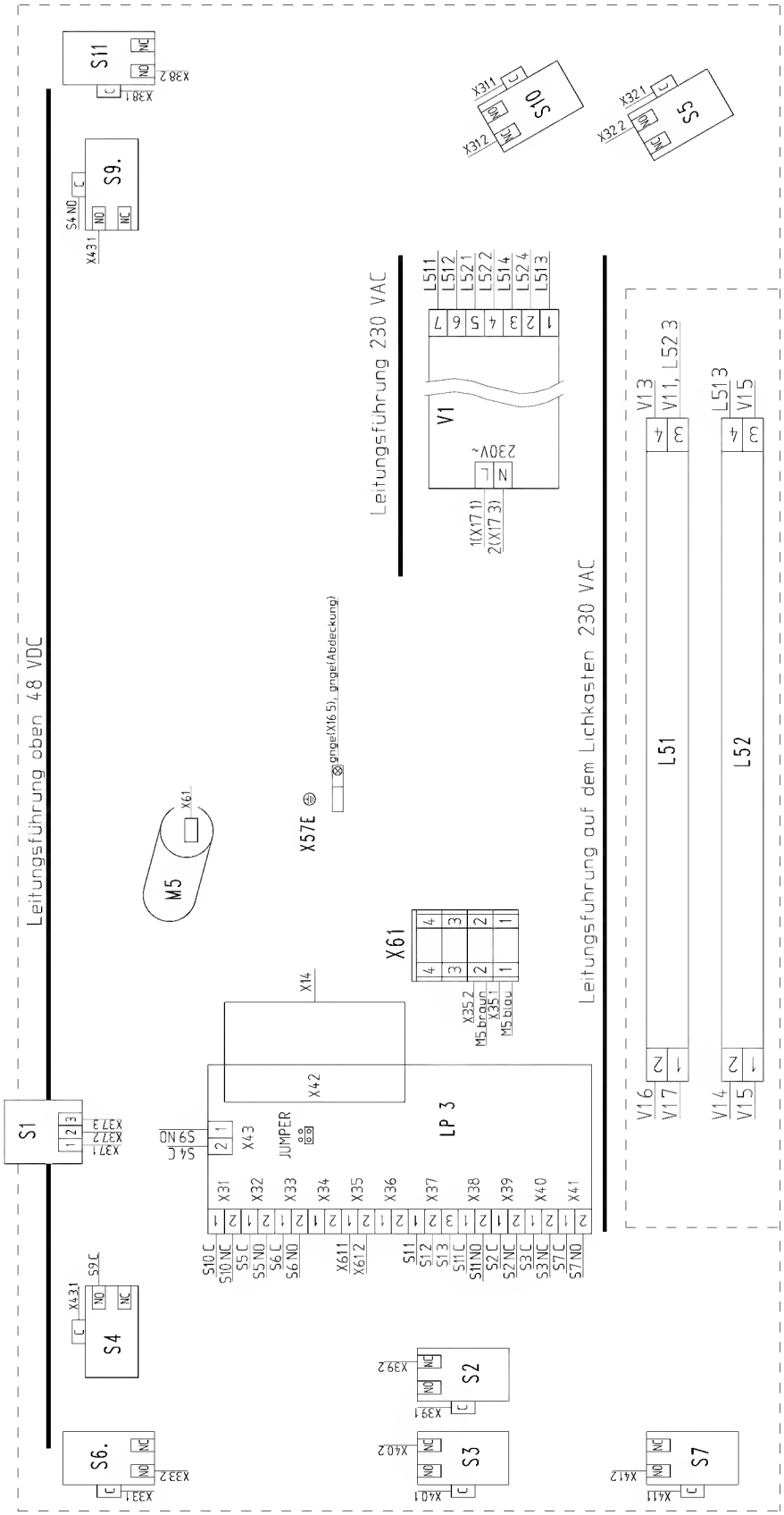
50077288-A_1 HERASafe KS, 230 VAC Light box



Verdrahtung V1 + L51 + L52 für KS9 und KS12

C. Wiring diagrams

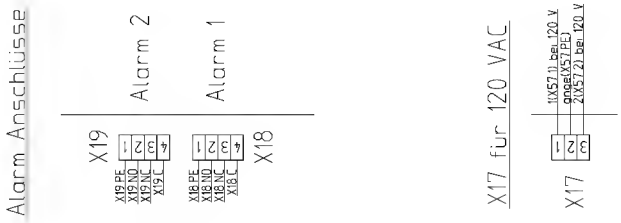
50077288-A_2 HERASafe KS, 230 VAC Light box

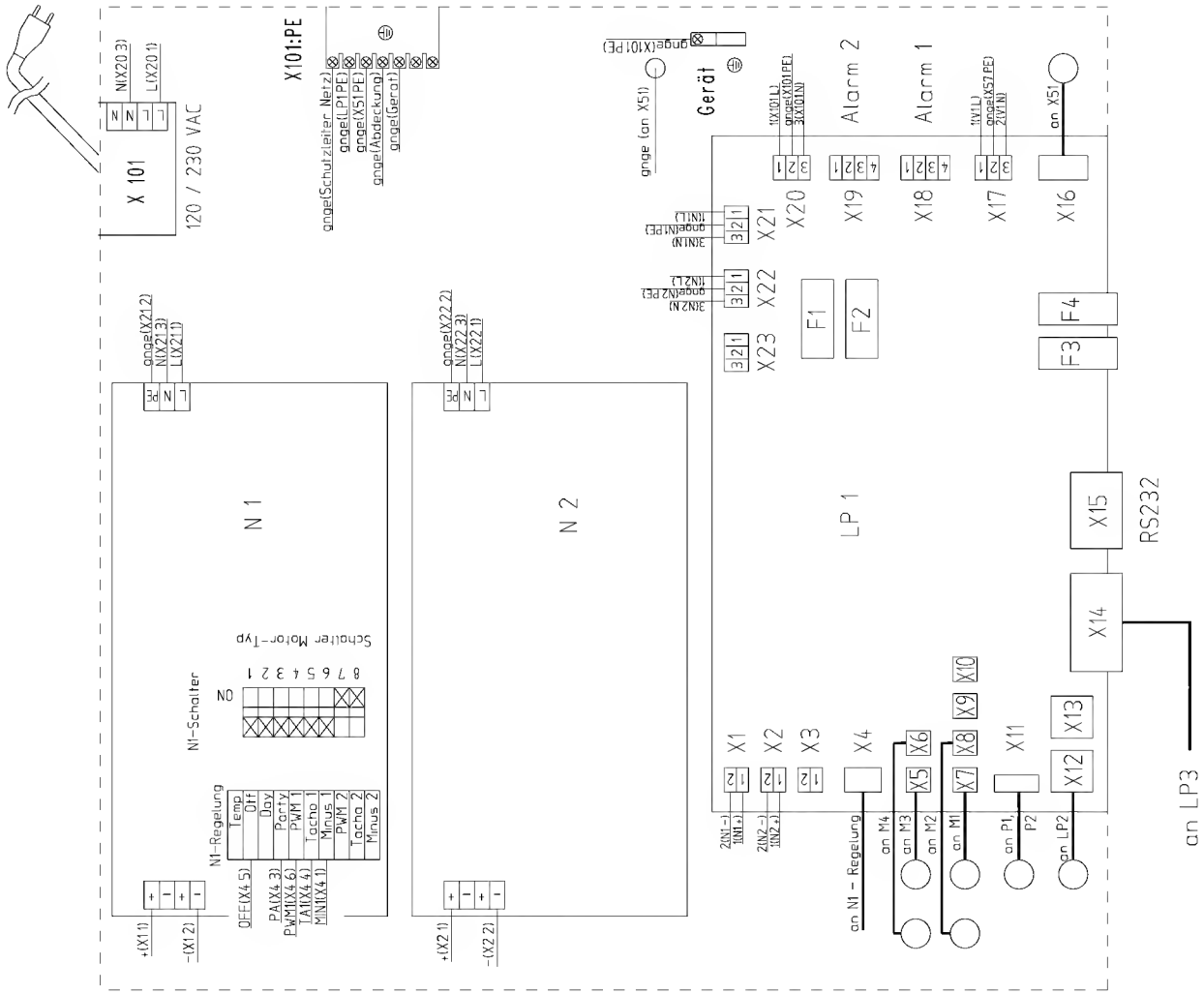


Verdrahtung V1 + L51 + L52 für KS15 und KS18

C. Wiring diagrams

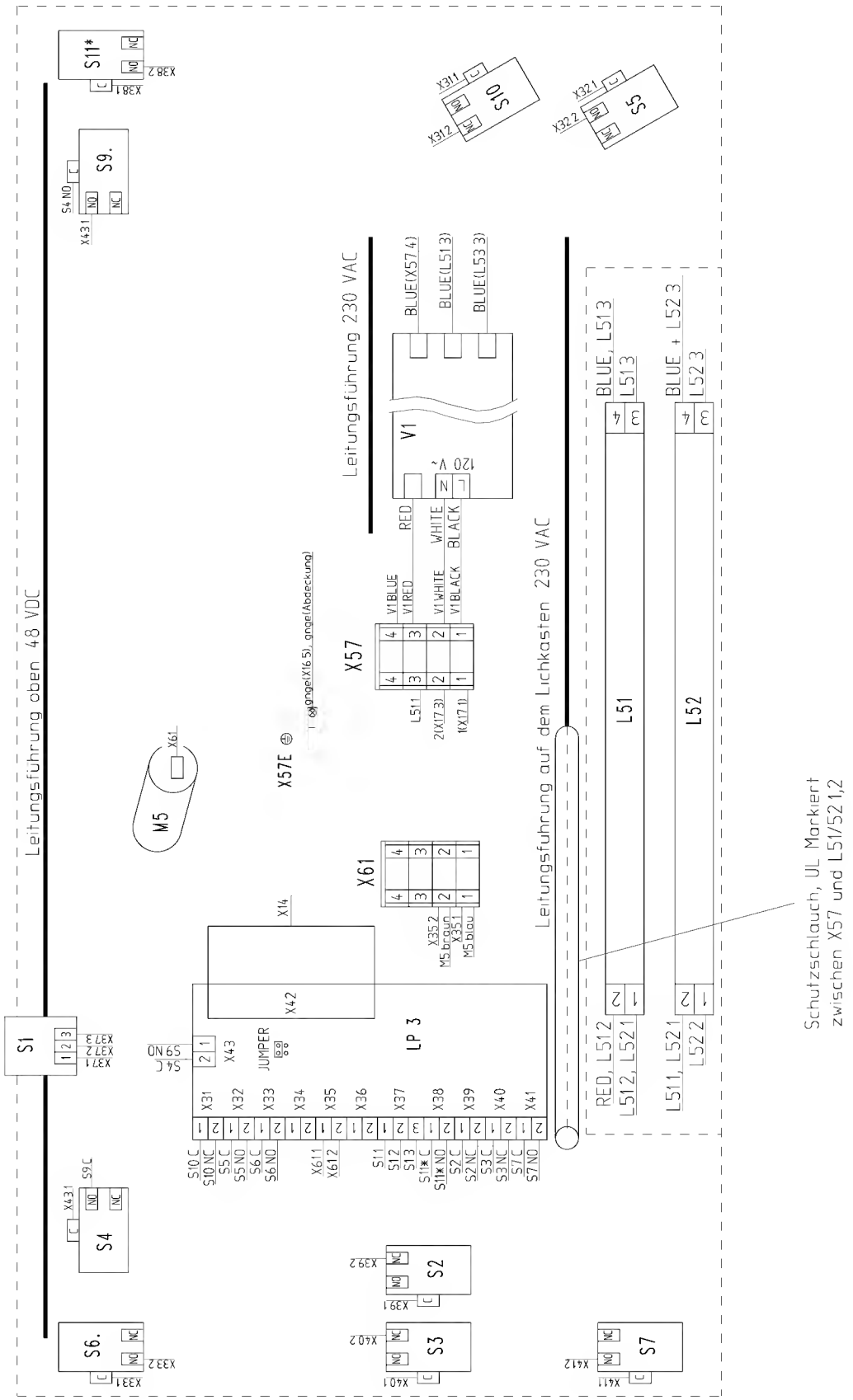
50077289-A HERASafe KS, 230 VAC Electrobox





C. Wiring diagrams

50077300-A HERASafe KS, 120 VAC Light box

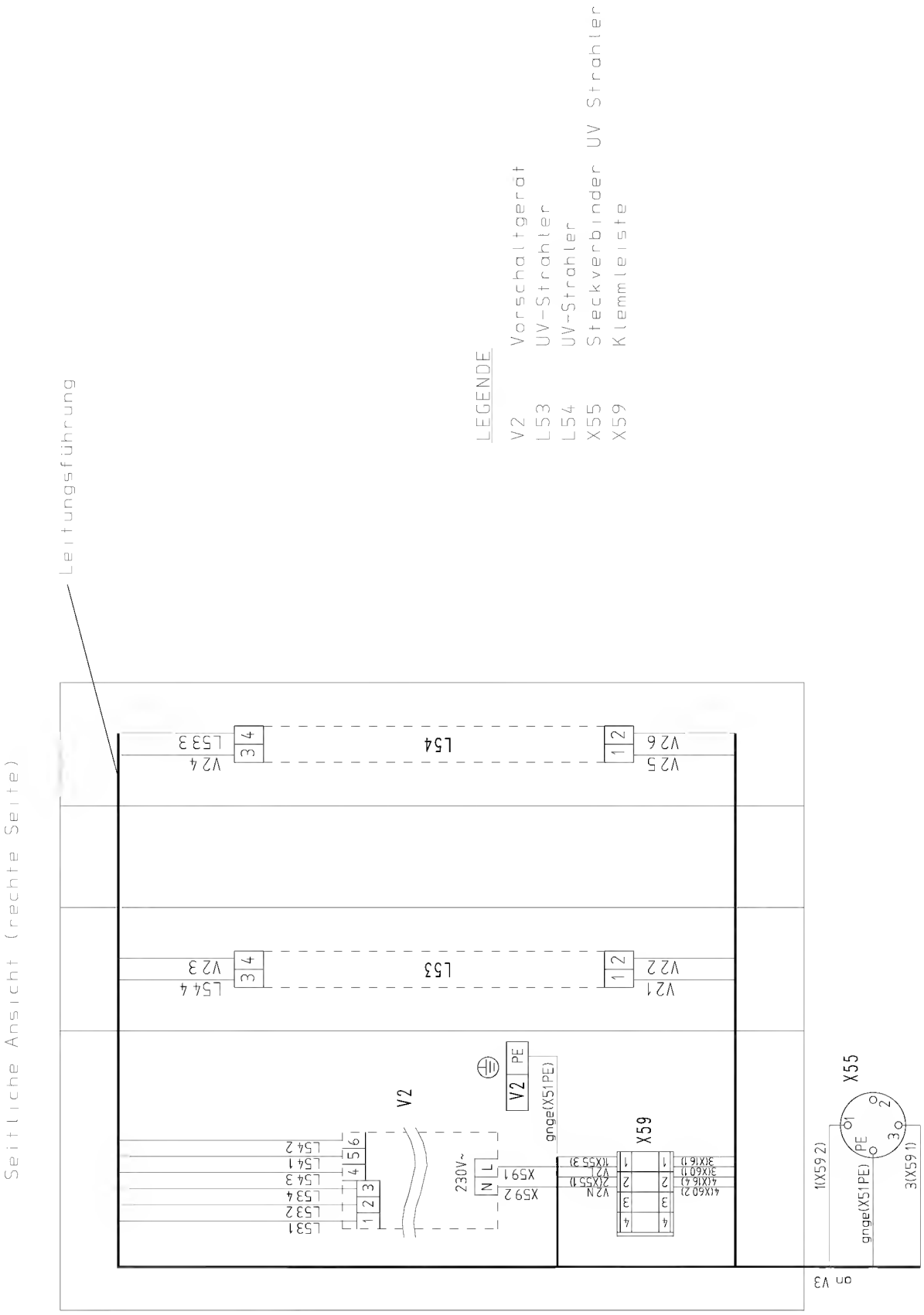


S11* => nur bei KS 15 und 18

Jumper bei KS 15 und 18 =>

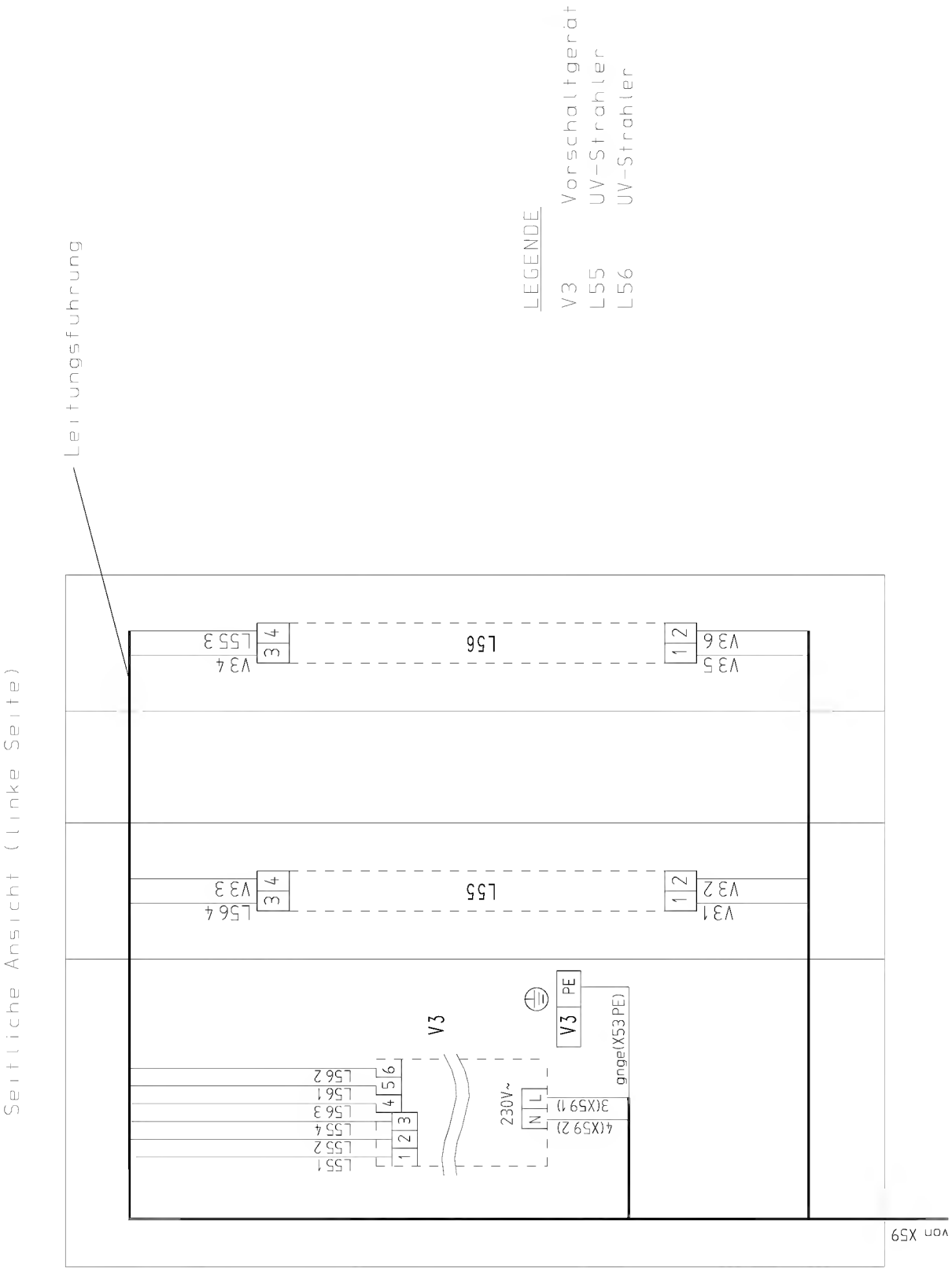
C. Wiring diagrams

50077945_1 HERASafe KS, 230 VAC, UV Side



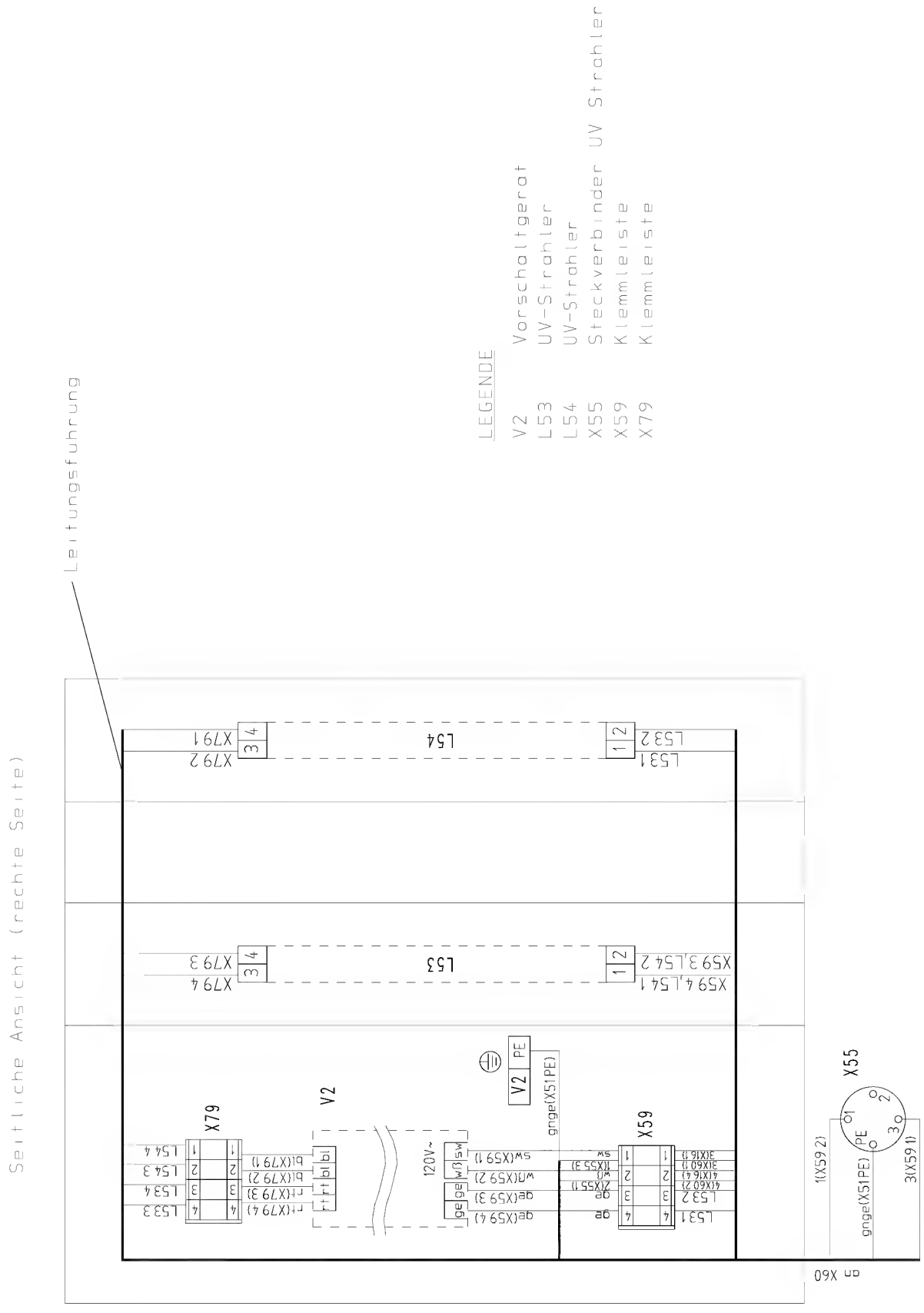
C. Wiring diagrams

50077945_2 HERASafe KS, 230 VAC, UV Side



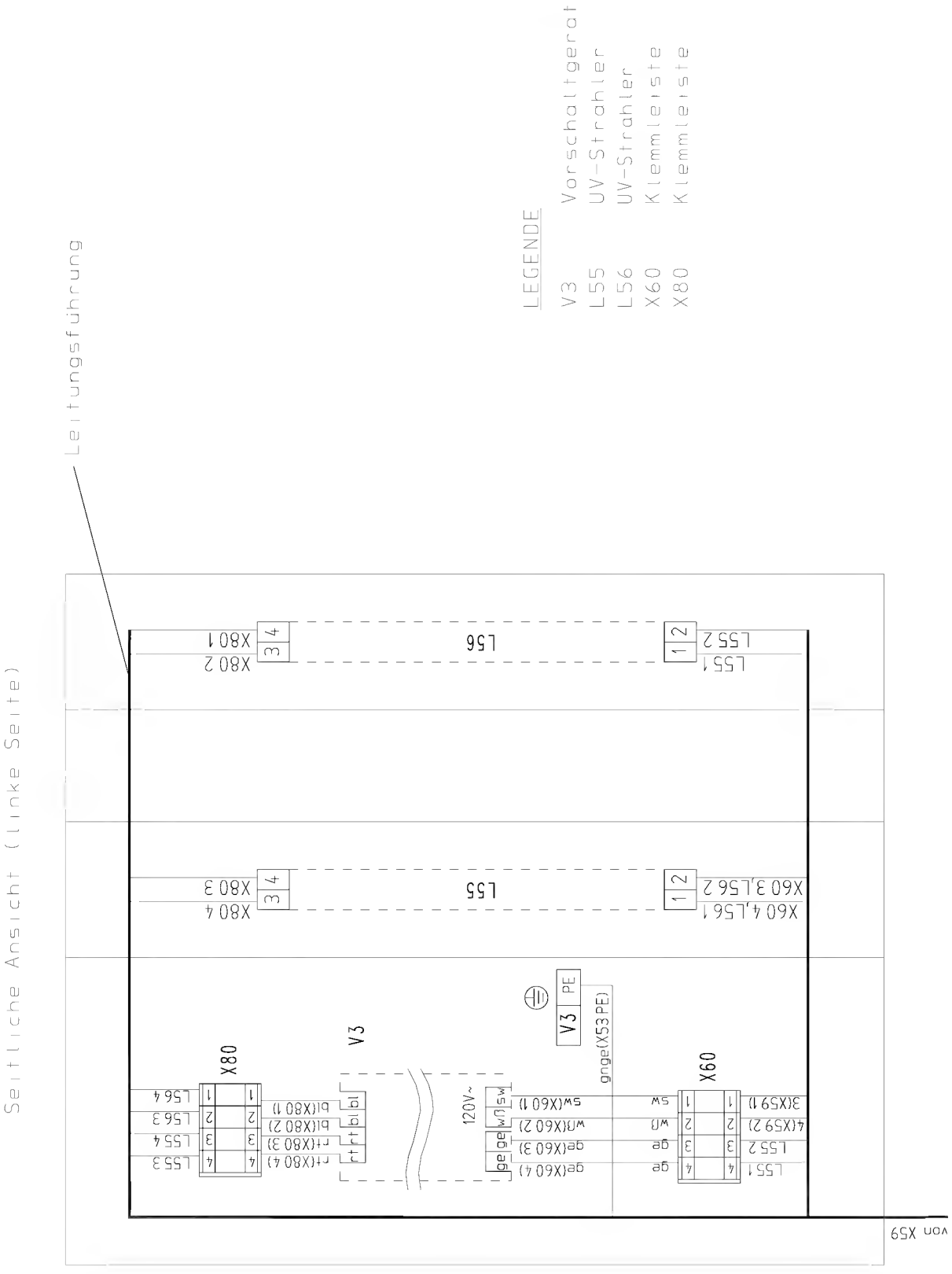
C. Wiring diagrams

50077946_1 HERASafe KS, 120 VAC, UV Side



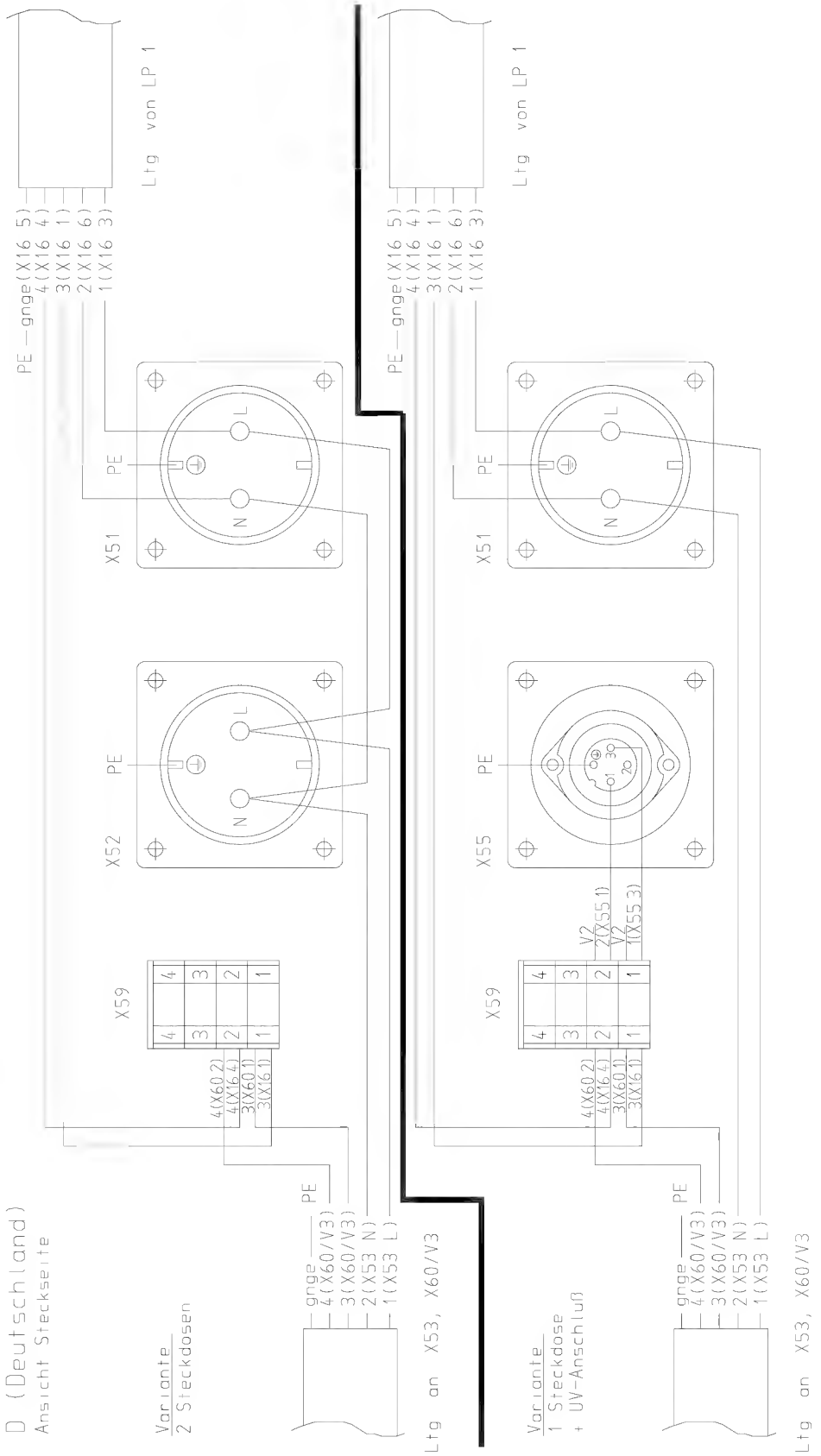
C. Wiring diagrams

50077946_2 HERASafe KS, 120 VAC, UV Side



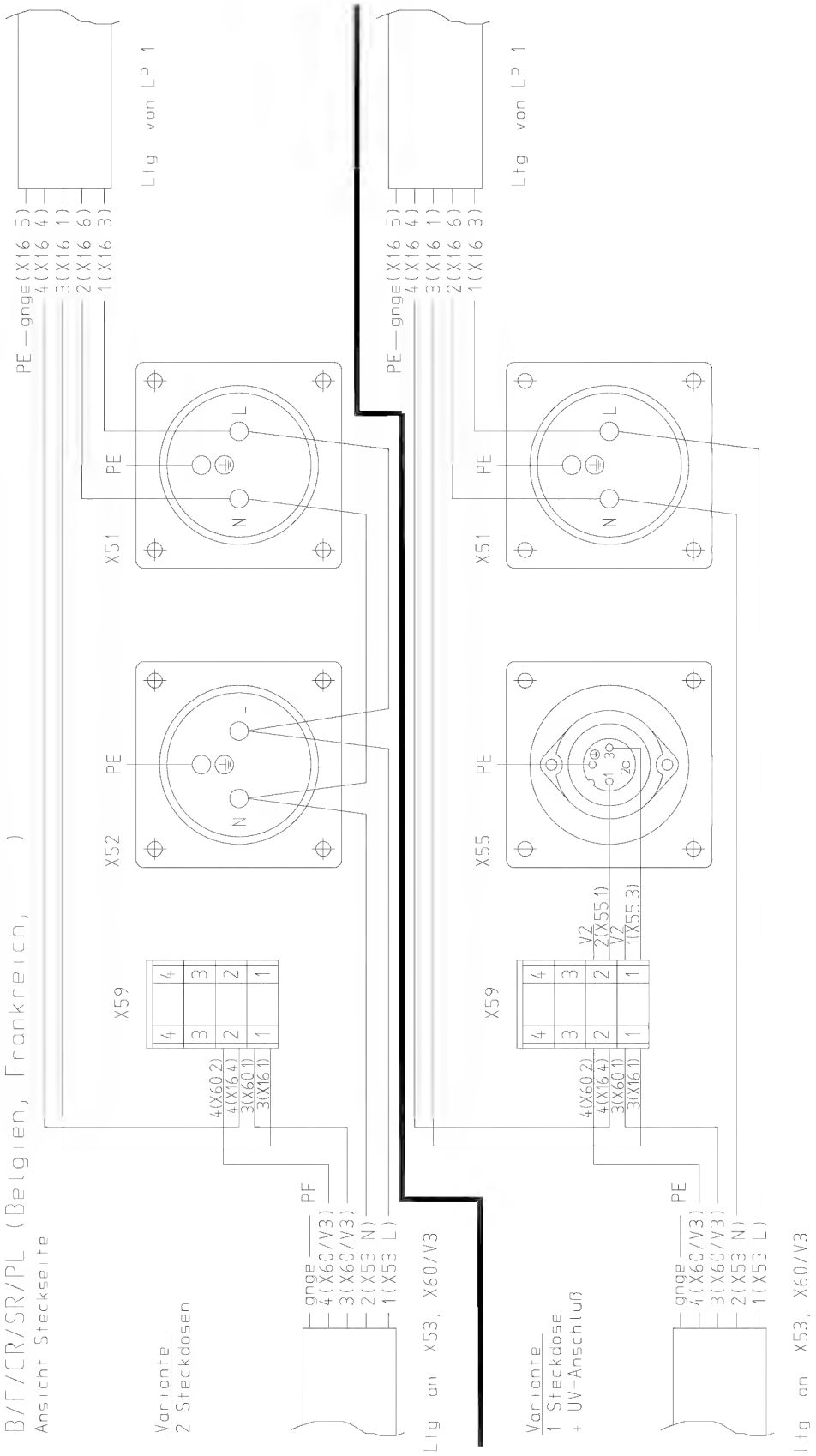
C. Wiring diagrams

50077947_1 HERASafe KS, Sockets D



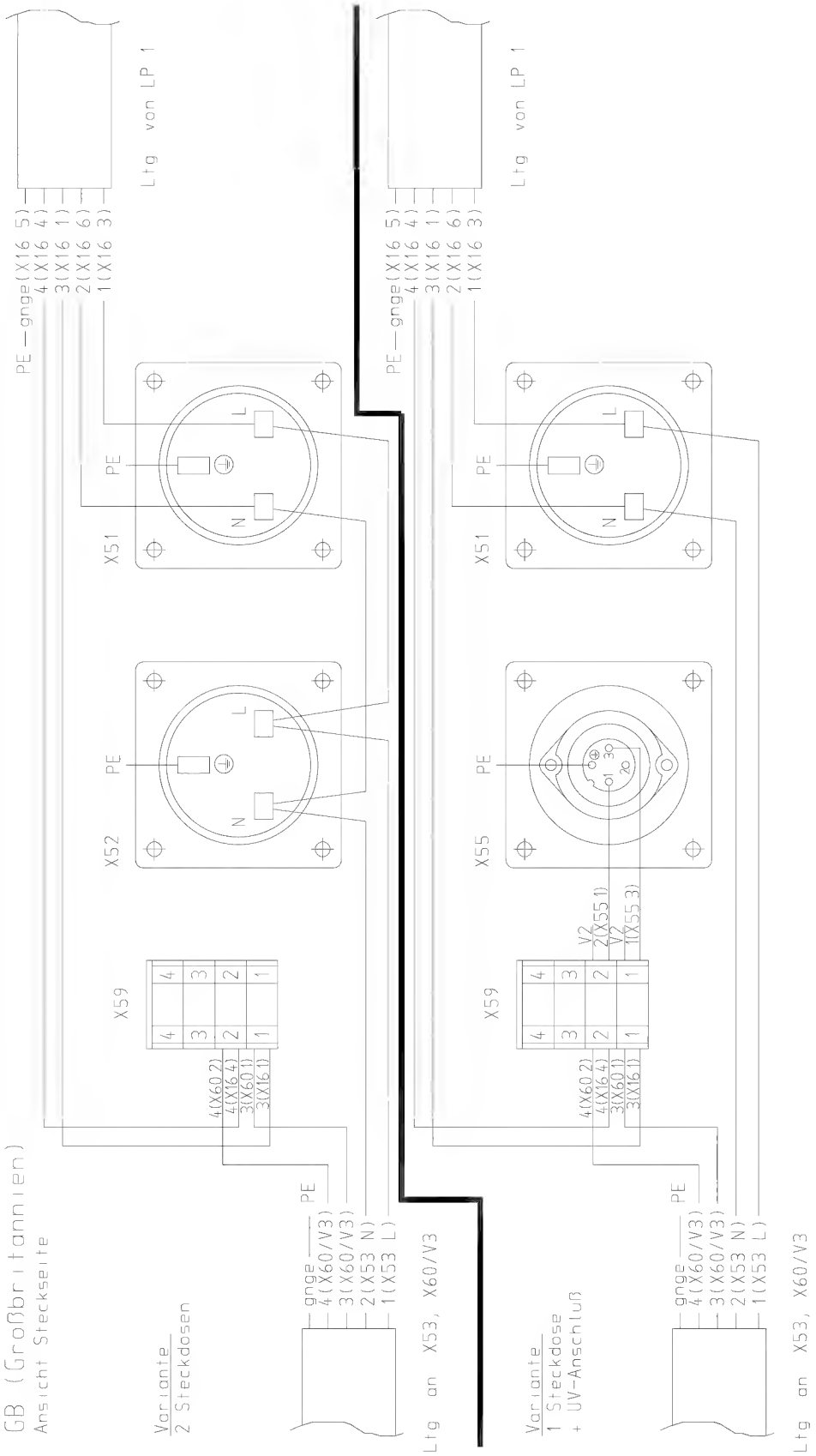
C. Wiring diagrams

50077947_2 HERASafe KS, Sockets B/F/CR/SR/PL



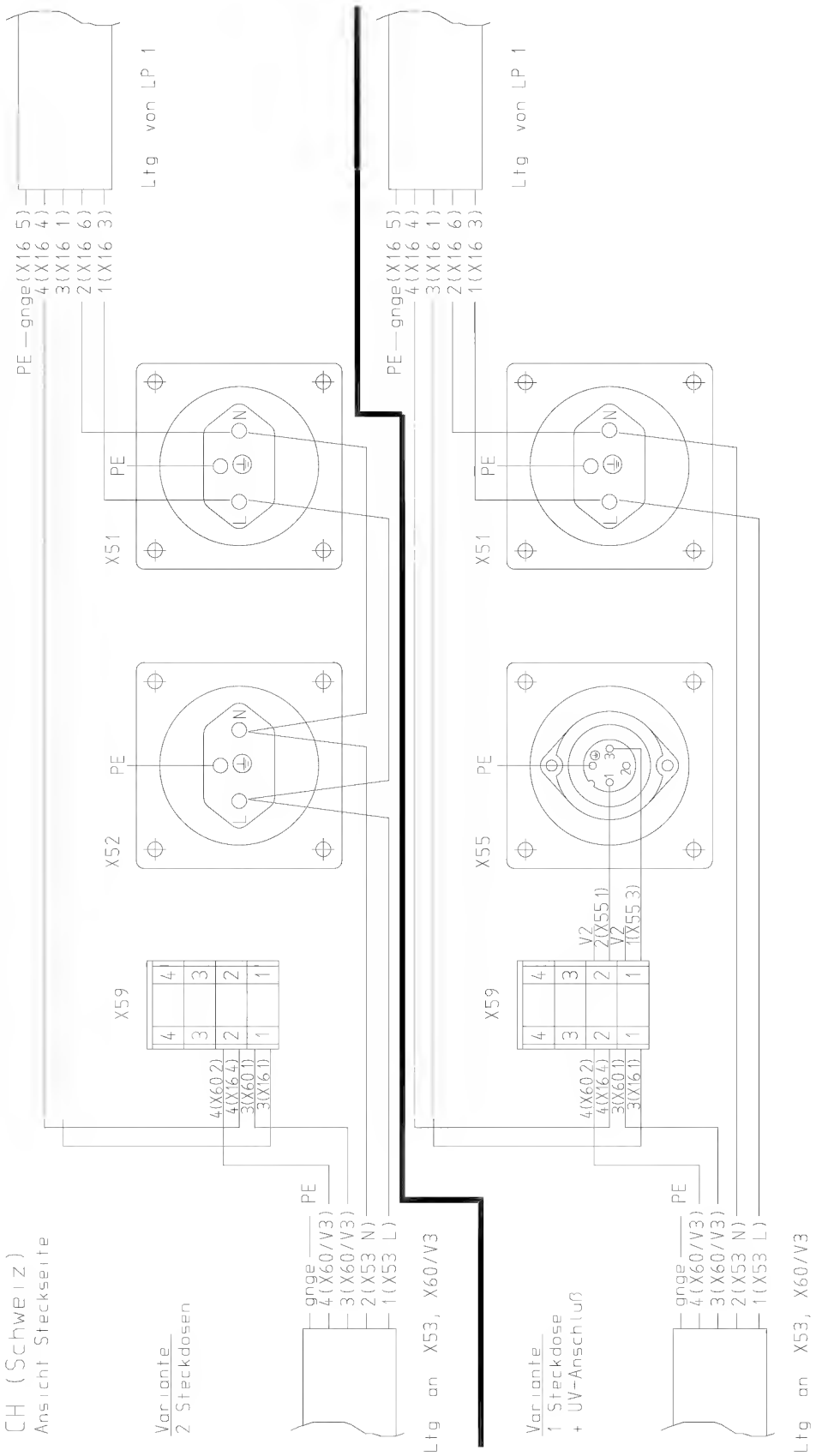
C. Wiring diagrams

50077947_3 HERASafe KS, Sockets GB



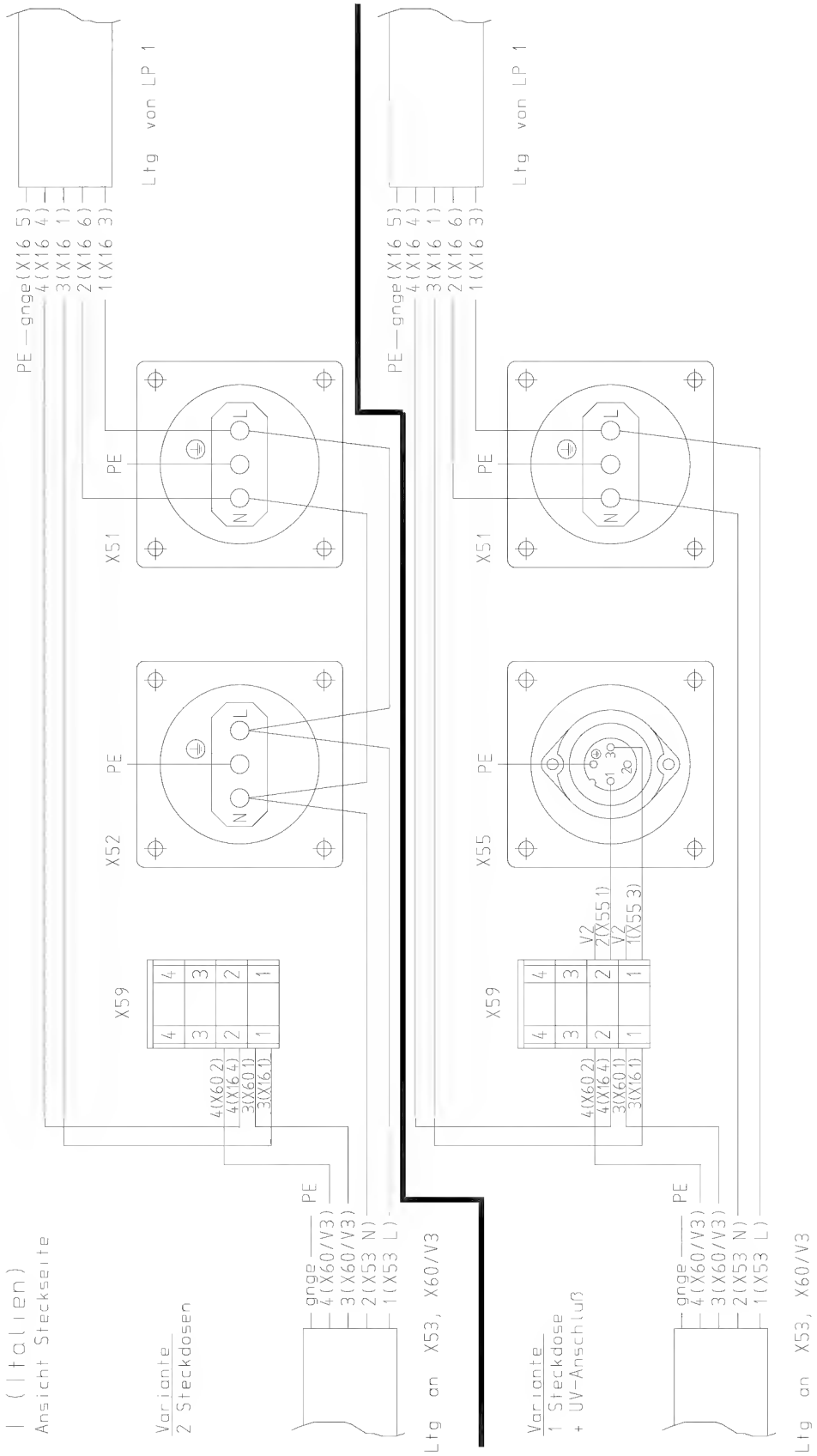
C. Wiring diagrams

50077947_4 HERASafe KS, Sockets CH



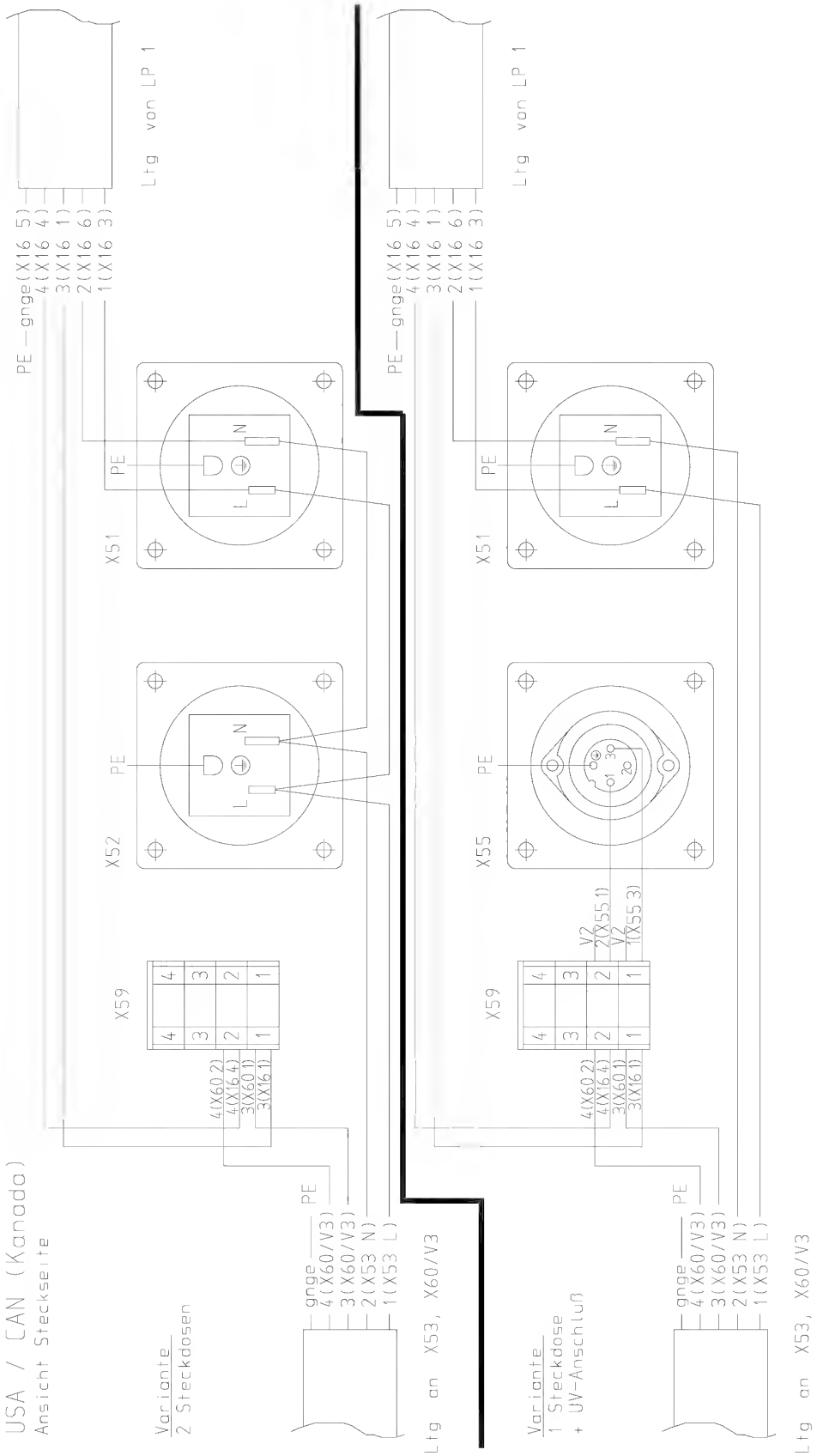
C. Wiring diagrams

50077947_5 HERASafe KS, Sockets I



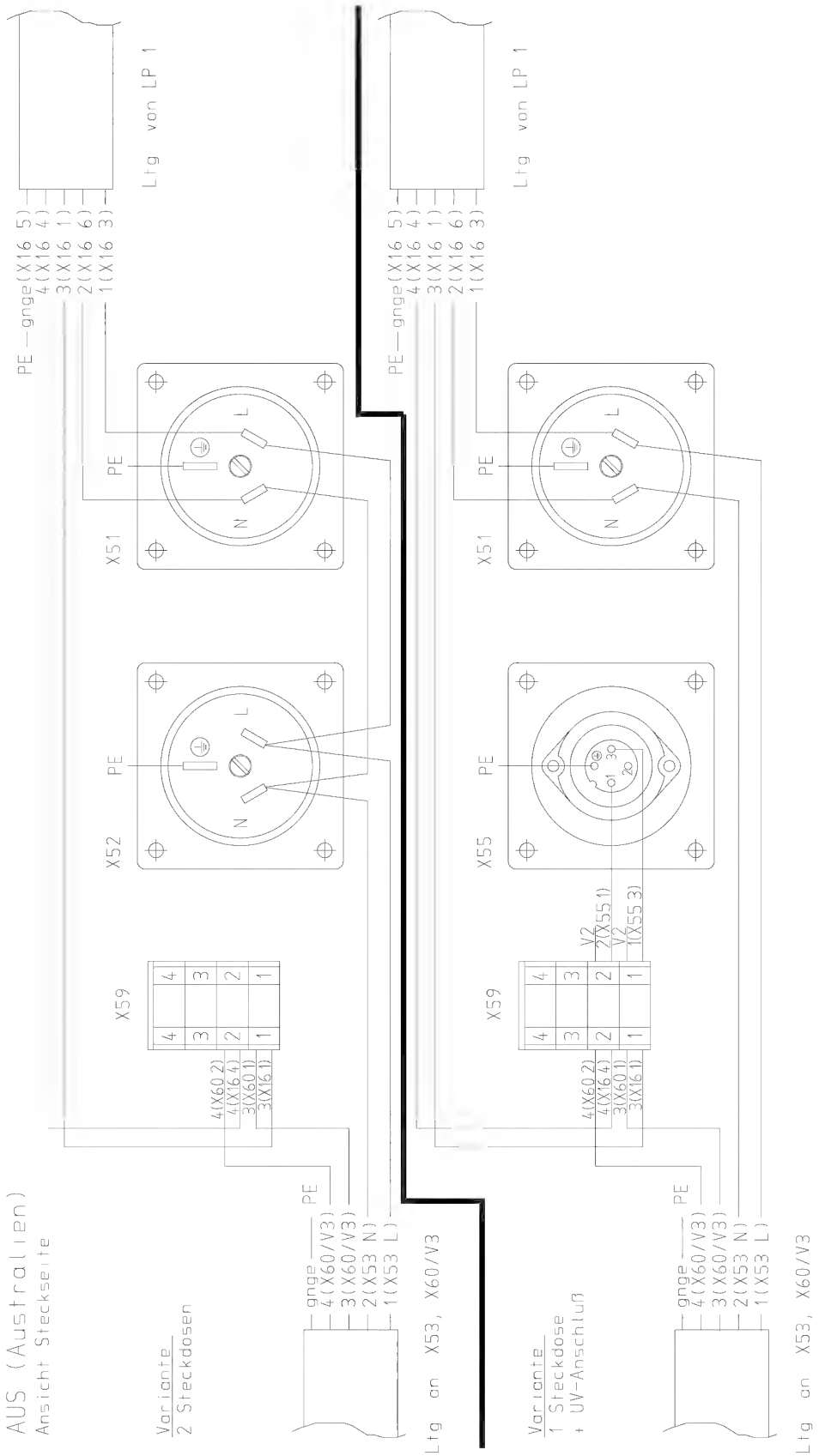
C. Wiring diagrams

50077947_6 HERASafe KS, Sockets USA/CAN



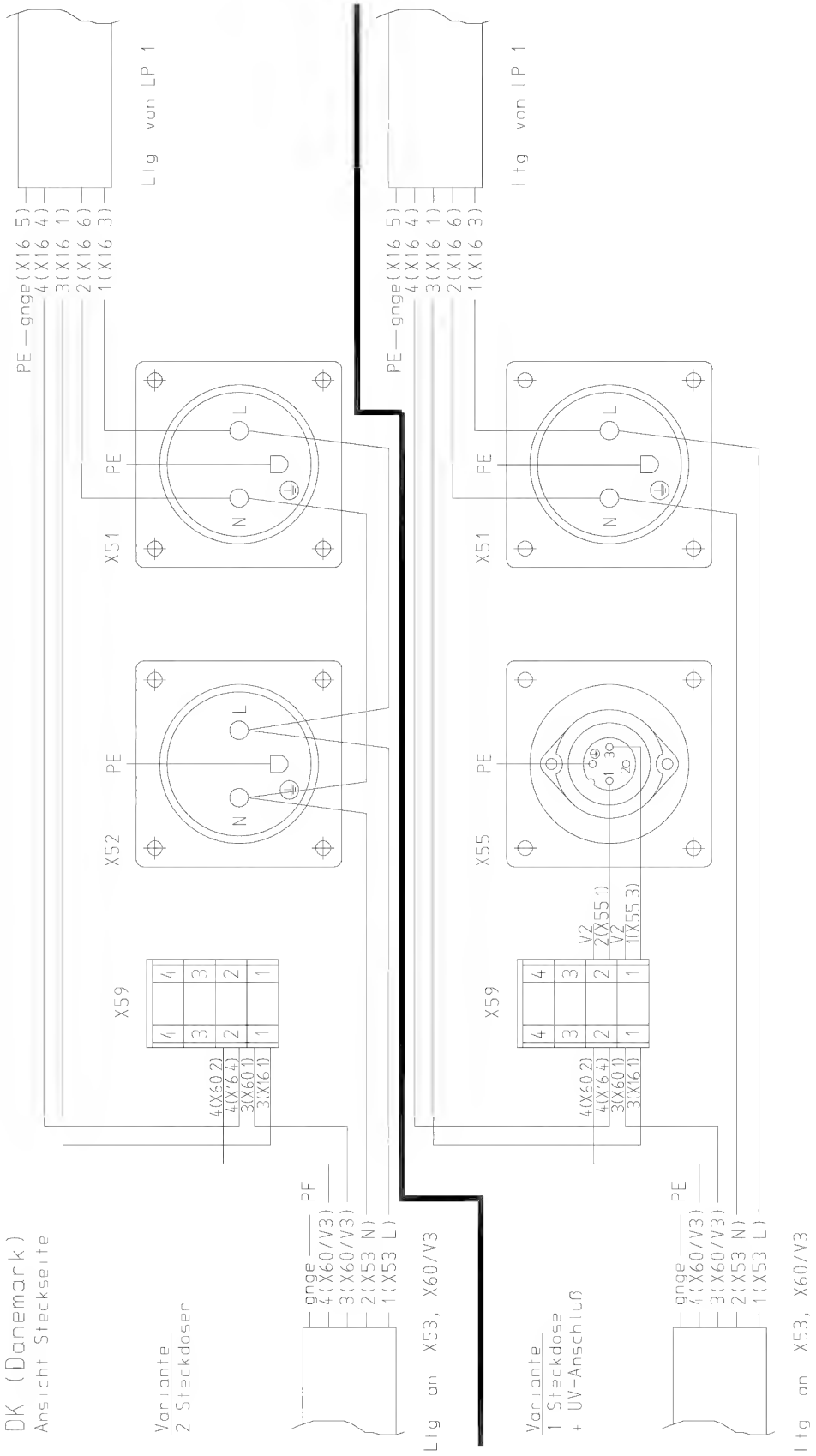
C. Wiring diagrams

50077947_7 HERASafe KS, Sockets AUS



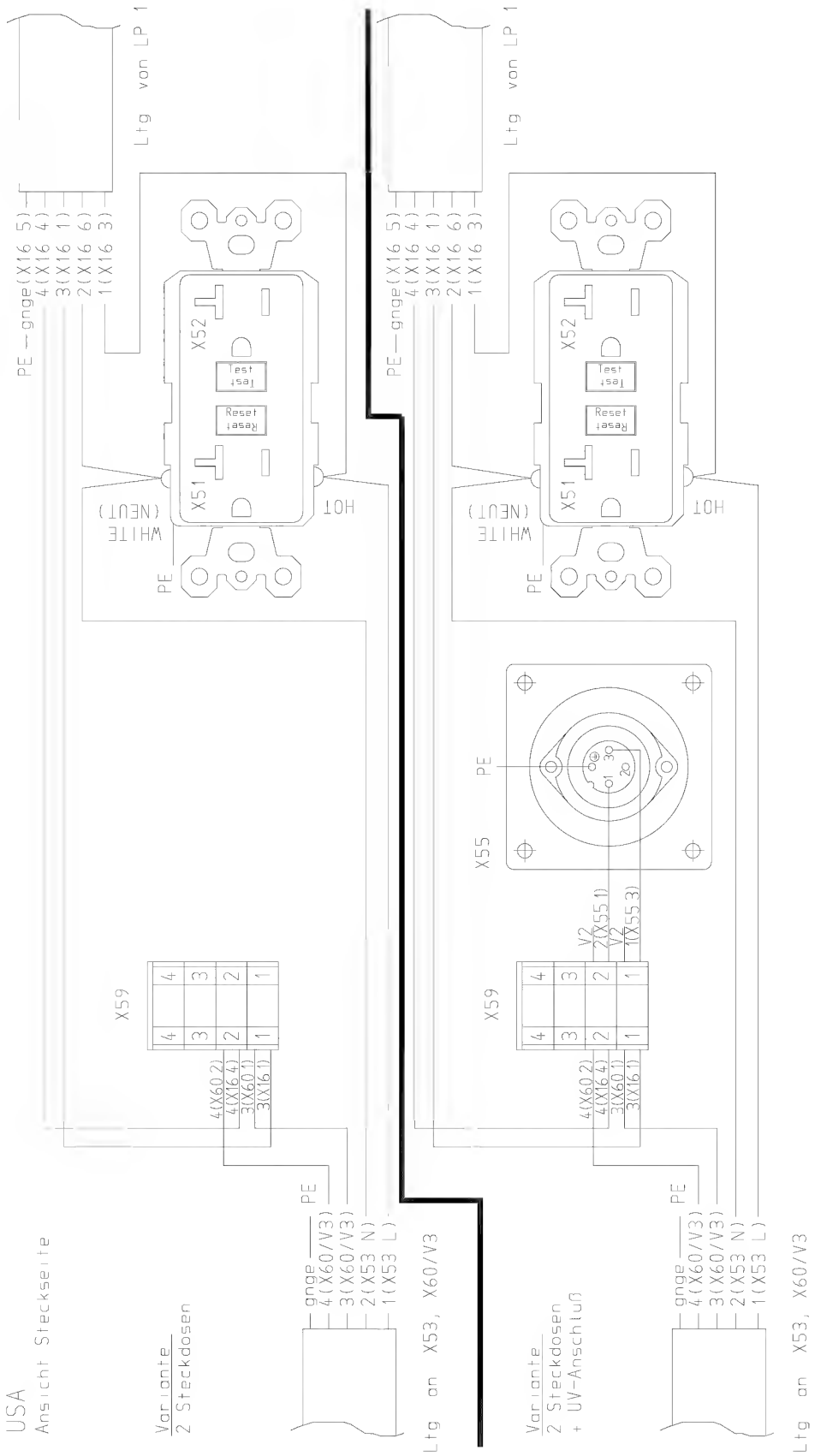
C. Wiring diagrams

50077947_8 HERASafe KS, Sockets DK



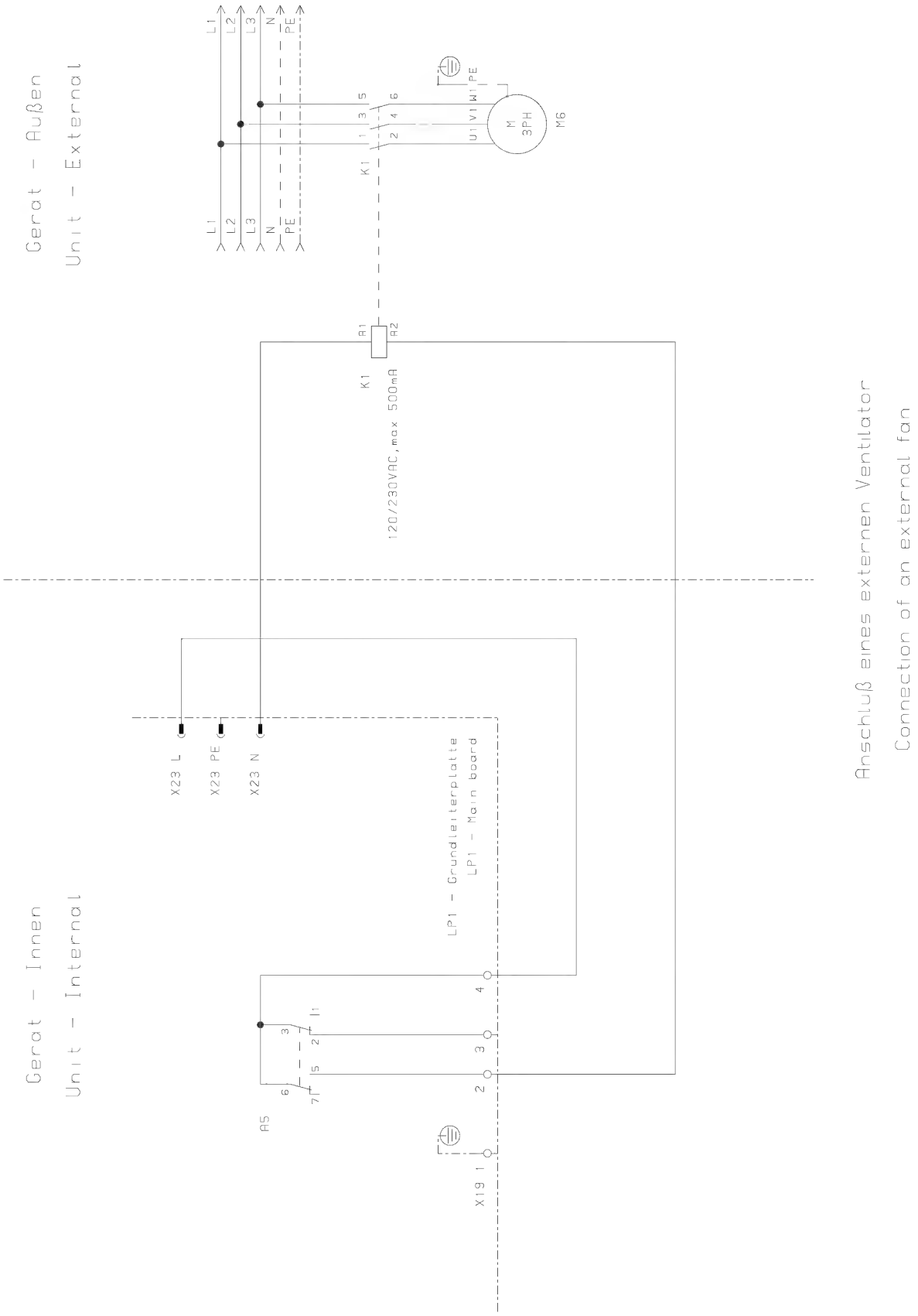
C. Wiring diagrams

50077947_9 HERASafe KS, Sockets USA



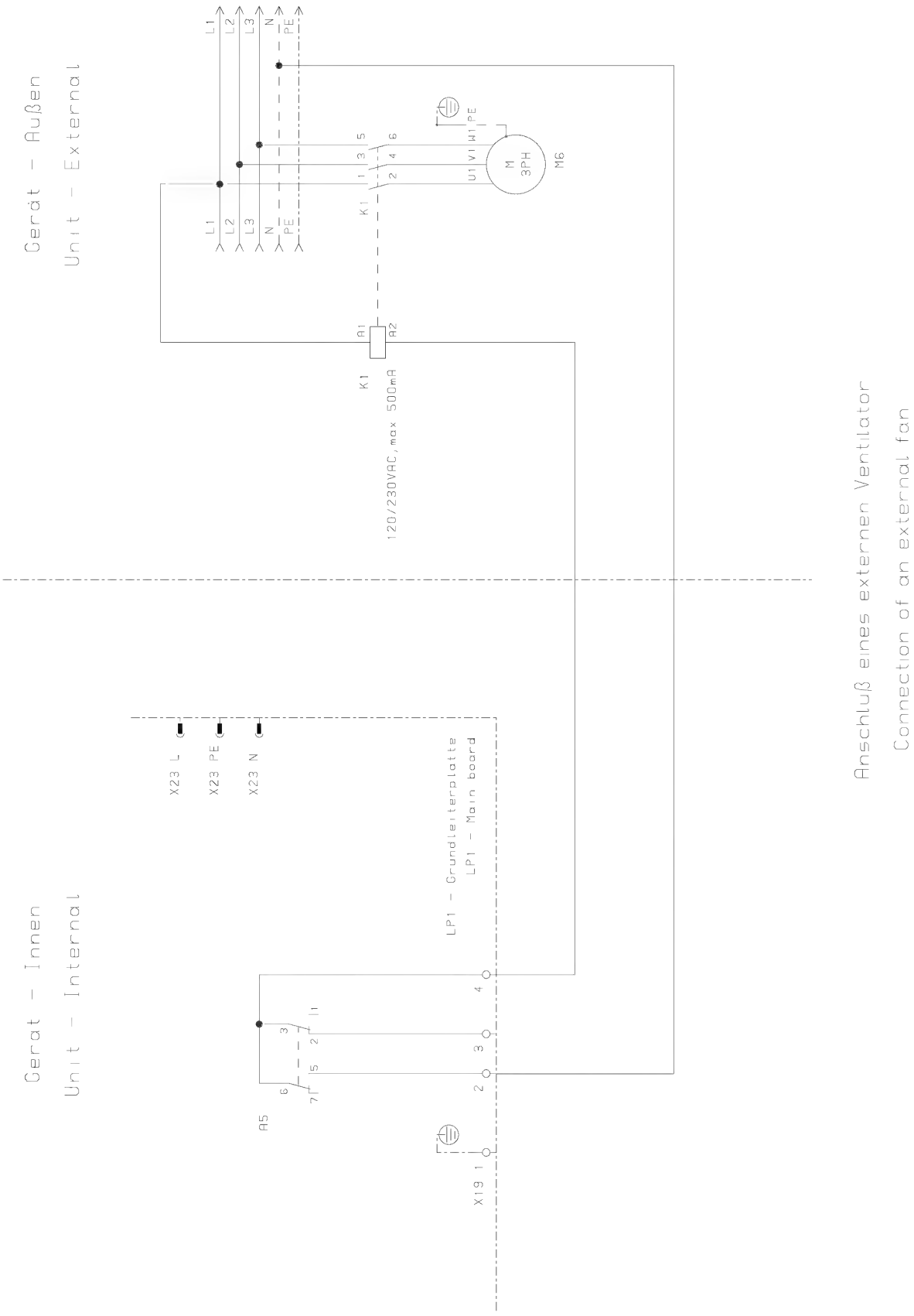
C. Wiring diagrams

50078744_1 HERASafe KS(R), External fan



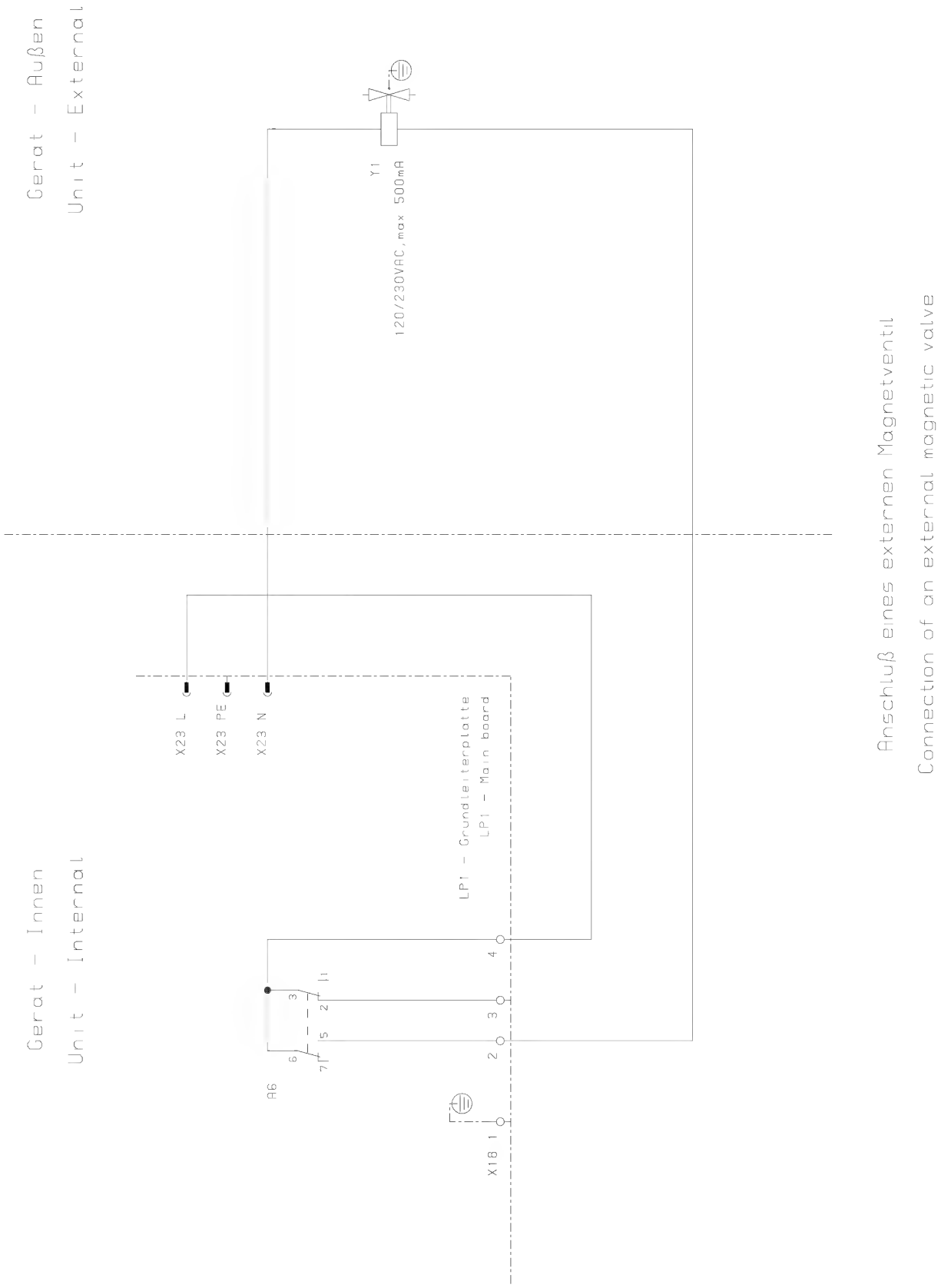
C. Wiring diagrams

50078744_2 HERASafe KS(R), External fan



C. Wiring diagrams

50078746 HERASafe KS(R), Gas magnet valve



D. Spare parts

List 1:

Item	Part No.	Description	Quantity
10	50077473	CD documentation HERAsafe KS	1
20	50077286	Wiring diagrams HERAsafe KS	1
30	50076199	Side window, left, right, glass	1
30	50077323	Side window, left, right, stainless steel	1
30	50077324	Side window, left, right, macrolon (polycarbonate)	1
40	50048679	Power supply unit UVC lamp sidewall 2x18 W 230 V	1
40	50048679	Power supply unit UVC lamp SPOT 30 2x18 W 230 V	1
40	50048679	Power supply unit UVC lamp SPOT K 2x18 W 230 V	1
40	50060299	Power supply unit UVC lamp sidewall 2x15 W 120 V	1
40	50060299	Power supply unit UVC lamp SPOT 30 2x15 W 120 V	1
40	50060299	Power supply unit UVC lamp SPOT K 2x15 W 120 V	1
50	50073294	Terminal for UV power supply unit 120 V - WAGO 260	1
60	50076556	Interior trim left, for country-specific outlet	1
60	50076557	Interior trim left, for USA outlet	1
60	50076558	IInterior trim left, for country-specific outlet	1
60	50076559	Interior trim left, for USA outlet UV lamp	1
70	50076590	Interior trim left, for country-specific outlet, UV connection	1
70	50076591	Interior trim right, for USA outlet	1
70	50076593	Interior trim right, for USA outlet, UV connection	1
70	50076594	Interior trim right, for country-specific outlet, UV lamp	1
70	50076595	Interior trim right, for USA outlet, UV Strahler	1
70	50076597	Interior trim right, USA outlet, UV lamp, UV connection	1
80	50065824	Outlet USA	1
80	50073606	Outlet Germany (grounding outlet)	1
80	50073607	Outlet Switzerland	1
80	50073608	Outlet Belgium, France, Czechnia, Poland	1
80	50073609	Outlet Italy	1
80	50073610	Outlet Great Britain	1
80	50073611	Outlet Australia	1
80	50073612	Outlet Denmark	1
90	50057573	Hinged lid for outlet USA	1
90	50073605	Bezel with lid for country-specific outlet	1
100	50033991	Rotating socket for UVC disinfection lamp	1
110	50048537	UVC disinfection lamp 15 W 435 mm long, 230 V	1
110	50060298	UVC disinfection lamp 15 W 435 mm long, 120 V	1
120	50073613	Dummy plug for UV connection	1
130	3711067	UV connection receptacle 3-way	1
140	50043783	Sealing cap for UV connection receptacle	1
150	50073604	Bezel for country-specific outlet	1
160	50046294	Adhesive label UV	1
170	3651539	Cap for sidewall lead-in, plug-in type	1
170	50046334	Cap for sidewall lead-in, screw-on type, USA	1

D. Spare parts

List 2:

Item	Part No.	Description	Quantity
180	50077921	Flat gasket for screw-on cap USA	1
190	50044214	Sealant (silicone) transparent	1
200	50078303	Exhaust blower right adjustable KS 9/12/15/18	1
200	50078304	Exhaust blower left adjustable KS 15/18	1
205	3003753	Cap screw M 4 x 12	1
210	3000391	Cotter pin D 2.5 pressure frame attachment	1
215	50077505	Wing nut M 5 x 16 for pressure frame	1
220	50078283	Exhaust plenum pressure frame KS 12/15	1
220	50078284	Exhaust plenum pressure frame KS 18	1
220	50078285	Exhaust plenum pressure frame KS 9	1
225	50077654	Clamp washer for M 5	1
230	50077360	Wing nut M 5 x 30 for pressure frame	1
235	50077349	Spacer bolt M 5 x 35 mm	1
240	50077180	Downflow blower	1
250	50076853	Downflow plenum pressure profile	1
260	50071701	Pressure sensor	1
270	50072680	Test hose cap	1
280	50072732	Test hose adhesive labels	1
290	50076415	Downflow filter KS 9 Replacement	1
290	50073911	Downflow filter KS 12 Replacement	1
290	50076417	Downflow filter KS 15 Replacement	1
290	50074265	Downflow filter KS 18 Replacement	1
300	50077689	Exhaust filter KS 9 Replacement	1
300	50059628	Exhaust filter KS 12/15 Replacement	1
300	50077700	Exhaust filter KS 18 Replacement	1
320	50073356	Plug 3/8"	1
325	50073358	Trim bezel for media connection	1
330	50046005	Power supply cable EU (grounded)	1
330	50058427	Power supply cable USA	1
330	50067124	Power supply cable Switzerland	1
330	50067125	Power supply cable Italy	1
330	50067126	Power supply cable Great Britain	1
330	50067127	Power supply cable Denmark	1
330	50067177	Power supply cable Australia	1
340	50076858	Plenum cover seal short KS 9/12/15/18	1
350	50076870	Plenum cover seal long KS 9	1
350	50076857	Plenum cover seal long KS 12	1
350	50076829	Plenum cover seal long KS 15	1
350	50076828	Plenum cover seal long KS 18	1
360	50073574	Front window seal KS 9	1
360	50073575	Front window seal KS 12	1
360	50073576	Front window seal KS 15	1

D. Spare parts

List 3:

Item	Part No.	Description	Quantity
360	50073577	Front window seal KS 18	1
370	50076845	Front window hinge bushing	1
380	50076811	Front window hinge bolt	1
390	3161568	Hinge bolt lock washer	1
400	50076886	Hinge window closing spring	1
410	50076359	Slide for hinge window latch	1
420	50078324	Cap screw M 4 x 30 for slide	1
430	3039297	Cap nut M 4 for slide	1
440	50033991	Rotating socket for luminescent tubes	1
450	50035339	Grommet for cable guard tube	1
460	50073996	Wire cable deflection roller	1
470	50073285	Wire cable deflection roller bearing bolt	1
480	50077315	Cable reel cable guard	1
490	50076878	Motor/transmission assy. for window drive	1
500	50077522	Motor mounting screws	1
510	56653114	Motor mounting toothed washer	1
520	50077399	Spacer tube for motor shaft	1
530	50077533	Key for motor shaft spline	1
540	3005854	Screws M 4 x 6 for motor mounting	1
550	56650750	Screws M 4 x 12 for motor mounting	1
560	50076880	Wire cable left and right KS 9 / 12	1
560	50077087	Wire cable left and right KS 15 / 18	1
570	50078012	Cable guard tube 310 mm KS 9	1
570	50076881	Cable guard tube 460 mm KS 12	1
570	50078013	Cable guard tube 610 mm KS 15	1
570	50077375	Cable guard tube 755 mm KS 18	1
580	50042227	Lock washer for transmission shaft	1
590	50068051	Retaining screw M 5 x 10 for cable	1
600	3003102	Lock washer 5.3 for cable	1
610	50073690	Position switch with roller lever, gold contact	1
620	50044371	Insulation plate for position switch	1
630	50043203	Position switch with roller lever	1
640	50076297	Front window cable lock	1
650	3005854	Cable lock screw	1
660	50078618	Position switch actuator, replacement, with screws	1
670	56650737	Countersunk screw M 4 x 10 for switch actuator	1
680	56650741	Countersunk screw M 4 x 6 for switch actuator	1
690	50077615	Countersunk screw M 4 x 6 for switch actuator, plastic	1
700	50077779	Front window assy. KS 9-R	1
700	50076294	Front window assy. KS 12-R	1
700	50077780	Front window assy. KS 15-R	1
700	50077431	Front window assy. KS 18-R	1

D. Spare parts

List 4:

Item	Part No.	Description	Quantity
720	50076884	Gas strut KS 9 and KS12 350 N, complete	1
720	50076885	Gas strut KS 15 and KS 18 500 N, complete	1
740	50076464	Display panel foil	1
750	50071798	Display panel	1
770	50049871	Pilot switch	1
800	50048679	Power supply unit for illumination 2x18 W 230 V KS 9	1
800	50049671	Power supply unit for illumination 2x24 W 230 V KS 12	1
800	50049672	Power supply unit for illumination 2x36 W 230 V KS 15	1
800	50049673	Power supply unit for illumination 2x58 W 230 V KS 18	1
800	50060299	Power supply unit for illumination 2x15 W 120 V KS 9	1
800	50072634	Power supply unit for illumination 2x40 W 120 V KS 12/15/18	1
820	50077297	Luminescent tube for illumination 590mm 18 W 230 V KS 9	1
820	50077296	Luminescent tube for illumination 590mm 17 W 120 V KS 9	1
820	50043933	Luminescent tube for illumination 895mm 30 W 230 V KS 12	1
820	50073547	Luminescent tube for illumination 895mm 25 W 120 V KS 12	1
820	50043931	Luminescent tube for illumination 1200mm 36 W 230 V KS 15	1
820	50058007	Luminescent tube for illumination 1200mm 32 W 120 V KS 15	1
820	50043932	Luminescent tube for illumination 1500mm 58 W 230 V KS 18	1
820	50060415	Luminescent tube for illumination 1500mm 40 W 120 V KS 18	1
830	50077703	Knurled screw for plenum cover	1
840	50043822	Adhesive label "Biohazard" EMEA	1
840	50062779	Adhesive label "Biohazard" USA	1
850	50075527	Plenum cover KS 9	1
850	50076771	Plenum cover KS 12	1
850	50075528	Plenum cover KS 15	1
850	50077372	Plenum cover KS 18	1
860	50044370	Adhesive label "HERAsafe"	1
870	50077781	Light box shroud KS 9 RAL 5018	1
870	50077783	Light box shroud KS 9 RAL 9002	1
870	50077785	Light box shroud KS 9 RAL 9006	1
870	50076887	Light box shroud KS 12 RAL 5018	1
870	50077338	Light box shroud KS 12 RAL 9002	1
870	50077616	Light box shroud KS 12 RAL 9006	1
870	50077782	Light box shroud KS 15 RAL 5018	1
870	50077784	Light box shroud KS 15 RAL 9002	1
870	50077786	Light box shroud KS 15 RAL 9006	1
870	50076889	Light box shroud KS 18 RAL 5018	1
870	50077430	Light box shroud KS 18 RAL 9002	1
870	50077618	Light box shroud KS 18 RAL 9006	1
880	50070459	Screw M 4 x 6 for light box shroud	1
890	50076846	Floorpan filter protection mats KS 9/12	1
890	50076921	Floorpan filter protection mats KS 15/18	1

D. Spare parts

List 5:

Item	Part No.	Description	Quantity
900	50076551	Metal trim left	1
910	50076552	Metal trim right	1
920	50075642	Double-faced adhesive tape	1
940	50073356	Wall bezel for media valve	1
950	50077339	Plug-in bezel UV lamp sidewall	1
960	50077165	Filter protection KS 9	1
960	50076877	Filter protection KS 12	1
960	50076923	Filter protection KS 15	1
960	50077164	Filter protection KS 18	1
970	50078276	Screw for filter protection	1
980	50077655	Lock washer for filter protection	1
990	3667303	PVC hose D = 6 x 1.5 mm	1
1000	50076465	Ball valve adjustable	1
1010	50078227	Floorpan drain with ball valve	1
1060	50075094	Battery for HERAsafe remote control	1
1070	50074415	HERAsafe remote control - SPARE	1
1080	50073464	Mounting for remote control	1
1090	50073461	Suction cup for remote control mounting	1
1100	50073989	Protective sleeve for remote control	1
1110	50072685	Workplate module KAM 30	1
1120	50073370	Lift strap for workplates	1
1170	50076876	Control box lid	1
1190	50076919	Master board	1
1200	50077208	Power supply unit 115 V / 48 V 150 W	1
1200	50077210	Power supply unit 230 V / 48 V 150 W	1
1210	50077209	Power supply unit 115 V / 48 V 150 W with control	1
1210	50077211	Power supply unit 230 V / 48 V 150 W with control	1
1220	3711683	Control box terminal with lid	1
1240	50063118	Fuse cartridge 16.0 A 250V T 6.3X32MM	1
1240	50073715	Fuse cartridge 5.0 A 250V T 6.3X32MM	1
1250	50078306	Switch PCB KS 9/12	1
1250	50078307	Switch PCB KS 15/18	1
1260	50077219	Front window control cable	1
1270	50077221	Wiring kit for outlet KS 9/12 230 V	1
1270	50077222	Wiring kit for outlet KS 9/12 120 V	1
1270	50077223	Wiring kit for outlet KS 15/18 230 V	1
1270	50077224	Wiring kit for outlet KS 15/18 120 V	1
1280	50077217	Wiring kit for illumination KS 15/18 230 V	1
1280	50077218	Wiring kit for illumination KS 15/18 120 V	1
1280	50077215	Wiring kit for illumination KS 9/12 230 V	1
1280	50077216	Wiring kit for illumination KS 9/12 120 V	1
1290	50077230	Control box housing wiring kit KS 9/12/15/18	1

D. Spare parts

List 6:

Item	Part No.	Description	Quantity
1290	50077231	Control box housing wiring kit Additional KS 15/18	1
1300	50077229	Display panel wiring kit	1
1310	50077228	Pressure sensor wiring kit	1
1320	50077227	Wiring kit UV outlet right	1
1330	50077225	Wiring kit UVC lamp side 230 V	1
1330	50077226	Wiring kit UVC lamp side 120 V	1
1360	3001247	Guide roller for racks	1
1370	50057739	Stand for racks	1
1380	50075275	Carbon filter for AEF - C KS 9/12/15/18	1
1380	50059628	Filter element for additional exhaust filter AEF KS 9/12/15	1
1380	50077700	Filter element for additional exhaust filter AEF KS 18	1
1390	50049653	Carbon filter for disinfection adapter	1
1400	50078613	Electrical lift unit "Multilift" left	1
1410	50078614	Electrical lift unit "Multilift" right	1
1420	50078615	Control 230 V for "Multilift"	1
1420	50078616	Control 120 V for "Multilift"	1
1430	50078617	Remote control for "Multilift"	1
1440	50077504	Operating instructions for electrically height-adjustable racks KFS 3	1

E. Parameter list

Overview of the functionparameter

Level	Function	KS 9	KS 12	KS 15	KS 18
P01	Software version	2			
P02	Parameter ID	see "Configuration identifier overview"			
P03	Window type	0			
P04	UV lamp/socket No (0) or Yes (1)	0 or 1, depending on device type			
P05	External consumer available No (0) or Yes (1)	0			
P06	Monitor alarm available No (0) or Yes (1)	1			
P07	Audible alarm can be silenced No (0), Yes (1) or no audible alarm (2)	0 (1)			
P08	Air velocity unit USA (feet/min) 1 or EMEA (m/s) 0	1 / 0			
P09	Control voltage for reduced downflow	30			
P10	Control voltage for reduced inflow	30			
Application in USA/Canada					
P13	Blower Performance Factor Offset		30		10
P14	Blower Performance Factor Window		10		8
Application in EU / Middle East / Africa					
P13	Blower Performance Factor Offset	0			
P14	Blower Performance Factor Window	100			
P15	Silenced alarm repeated after 0 – 60 Minuten	0			
P16	Holding time for key press code in seconds	5			
P17	Duration in minutes for automatic return from service level	15			
P19	Downflow velocity increase display	-			
P21	Audible signal after P 16 elapses for 0 – 1000 m/s	300			
P22	Reset total operating hours h/10 display	Carry-over upon PCB replacement			
P23	Audible alarm delay for timer start	25			
P24	Downflow blower limit value monitoring	50	50	50	25
P25	Current limit for window motor up in A	2,5			
P26	Current limit for window motor down in A	2,5			
P27	Auto alarm limit	150			

E. Test report

Test report

Device Id. No:

Device serial number:

Date of test:

Date of repeat test:

Test results:

Electrical tests
Polarity:
Ground resistance:
Leakage currents:
Airflow velocity tests
Inflow velocity:
Downflow velocity:
Airflow pattern tests
Airflow direction:
Front window leakproofness:
Work aperture leakproofness:
Seal leakproofness:
Filter leak tests
Exhaust filter leakproofness:
Downflow filter leakproofness:
Values for ergonomic tests
Lighting intensity:
Vibrations:
Noise level:
UV intensity

Tester
Surname:
First name:
Company:
Phone:
Fax:

Date, Signature

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